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ABSTRACT

This collection of articles on class scheduling problems emphasizes scheduling of music classes. The first part of the booklet contains descriptions of 11 current scheduling practices. The second part is concerned with data processing and the use of computers for scheduling, with discussion centering on the Stanford School Scheduling System. The last part of the booklet considers flexible scheduling, emphasizing a specific plan as used in the Brookhurst Junior High School in Anaheim, California. (DE)

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Scheduling Music Classes

Edited by

Robert H. Klotman

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CHAPTER ONE

Scheduling a Broadened Music Curriculum

Charles L. Gary

Schedules are impartial. They do not deny a student the chance to participate in orchestra because they dislike music or twelfth-grade oboists but only because they were designed to do something else that educators considered important.

Schedules are temporary. Though the schedule in a school may antedate any member of the faculty or administration, it need not continue forever. Seniority coupled with inertia can breed a formidable adversary, however, and music educators who are at odds with schedules may be well advised not only to attempt to understand their opponent but to seek allies amongst historians, artists, physical educators, and even administrators who have struggled under the heavy hand of restrictive scheduling.

Schedules were created to be slaves, not masters, and as servants they should reflect the aims of the total school program. If music in the school curriculum is to profit from the changes in scheduling practices now being made in many school systems, the goals of music education must be clearly defined and intelligently related to the total educational program. There is some indication that, at a national level at least, a redefinition of objectives is being made. At least two recent publications of professional organizations interested in secondary school music have stressed the fact that the schools are not primarily concerned with music for vocational, entertainment, or public relations purposes. The National Association of Secondary-School Principals position paper on "The Arts in the Comprehensive Secondary School" affirms that "the subjects taught and the experiences provided for all children in the area of the arts . . . are essential to the general education of *all* secondary-school youth."[1] And the Music Educators National Conference in *Music in General Education* has challenged music educators to return to their original charge of music for every child, in the secondary schools as well as in the lower grades.[2]

This would seem to indicate that a booklet on scheduling experiences

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[1] National Association of Secondary-School Principals. *The Arts in the Comprehensive High School.* Washington: The Association, 1962, p. 3.

[2] Karl D. Ernst and Charles L. Gary, editors. *Music in General Education.* Washington: Music Educators National Conference, 1965, p. 205.

in music must concern itself with more than how to make it possible for students from four different grades to attend the same band rehearsal or how to give students both instrumental and choral experiences and still have time for other required and elective subjects. Important as these questions may be to music educators, there are other more basic questions that must be asked if school schedules are to serve the goal of general education in music for all students. Some of these questions are:

1. How can the music educator or educators assigned to this school be scheduled to have the most impact on all the students?
2. How can the students with performing talents be utilized to help educate other members of the student body and at the same time further develop their own musical skills and understandings?
3. Can the quality of large performing groups be improved by enabling students to have courses in music theory, history, and literature, and small ensemble experience in addition to rehearsal time?
4. How can music educators be made available to "teaching teams" for broad field courses in history, literature, or the other arts?
5. How can music educators be assisted in utilizing the musical resources of the community in their teaching and in sharing the school's musical wealth with the community?
6. How can the schedule be made to serve the three student categories of students in the arts: "(1) those who create; (2) those who perform or do; (3) those who consume?"[3]
7. What type of schedule can encourage students to pursue their individual interests in music through club activities or opportunities to explore libraries for scores, tapes, records, and books?

The future, whether it involves expansion of music education in the direction discussed above or not, will certainly see the need for new scheduling practices. Even if high school music teachers should continue to serve only the small percentage of students interested primarily in performance, they will need help. Indications are that the long-awaited redress of the balance between the arts and other aspects of the curriculum may now be at hand. The role of the arts in the development of the individual should continue to find more support, with the result that there will be more students to teach. The increasing interest in creativity and its development is bound to have the same result—more students for the teachers of music and the other arts. More teachers of music will be required unless more effective use can be made of teachers' time through better scheduling.

To make the schedule serve rather than dictate, music educators should currently be involved in stating the objectives of their program and seeking ways of freeing students and teachers to work together to meet these goals.

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[3] *The Arts in the Comprehensive High School*, p. 7.

CHAPTER TWO

Current Scheduling Practices

Though a new approach to scheduling may offer hope for the future, many music educators are currently faced with situations that can only be solved within an existing framework. Some music programs across the country have had the benefit of imaginative thinking. On the following pages, eleven situations provide information on scheduling practices that music educators have found beneficial.

I A "Modified Schedule" Plan

Under the "Modified Schedule" plan of Nathan Hale High School in Seattle, Washington, every student may take six subjects without adding any time to the school day. This is made possible by the omission of one period in each subject during every seven-day cycle. "Classes are rotated so that they occur in different hours during each of the seven days, and some variation in length has also been achieved with a longer time span of 95 minutes accorded to each subject once during every cycle."[1]

This program was initiated in September 1963.—RHK

The six primary objectives of the modified scheduling plan are: (1) to increase subject selection opportunities for students, (2) to increase enrollments in elective subjects such as music, art, business education, and home economics, (3) to reduce the average daily pupil contact for teachers, (4) to achieve more flexibility in length of class periods, (5) to reduce the monotony or "learning lag" associated with conventional schedules by rotating periods, and (6) to provide some increase in the length of planning time for teachers.

Advantages

Students at Nathan Hale not only have the privilege of taking more electives if they wish, but they are also taking advantage of the extra periods to increase their number of required subjects. Studies reveal that the

[1] *Seattle Schools* (April 1965). Edited by Vivian Hedrick.

increase in number of courses per student has not lowered the grade point average of Nathan Hale students.

Under this plan there is more flexibility and variety in scheduling. Team teaching, such as in a new language arts-history combination at Hale, permits students to have an integrated course in history, literature, government, music, and art that is not available in a like form at any other school. Team teaching applied to the science program now permits teachers to work in the type and aspect of instruction (lecturing, tests, and demonstrations or laboratory work) for which they have the most talent and interest. Independent and supervised study are available for students who require one or the other, or both. Independent study in the language laboratory for advanced foreign language students provides students with an additional study tool, and is an economical use of teacher time since one teacher can supervise study and maintenance in several languages at once.

Disadvantages

The modified schedule plan is not without controversial aspects. Although the data indicate a strongly favorable learning environment, *it is the teacher whose efforts largely make this a reality*. Teachers at Hale must record attendance and grades for an average of 162 students as compared with 150 at Lincoln and 145 at Ingraham (other high schools in Seattle). Nathan Hale teachers also lose one scheduled preparation period during each seven-day cycle.

Students, too, must forego some of the latitude permitted by the conventional schedule. The modified plan sharply reduces in-schedule activity opportunities for students. There are fewer student classroom call-outs for extracurricular responsibilities. With a bus schedule that requires some students to leave the building at 2:30 p.m., after-school activity has been restricted.

Adjustments

As in any new program adjustments and revisions are necessary. Claude Turner, Nathan Hale principal, points out:

"To stimulate still greater use of the opportunity for students to elect classes in music, art, home economics, and industrial arts some change in programming is indicated, and will be initiated next year. For the slower-learning students, making up less than ten percent of the student body, a further modification of the program will be instituted to operate side-by-side with the present schedule which is designed to give educational advantages to the majority who can benefit most from them. More attention will be given to the use of the 95-minute period, with possible breaking of the time into modules that will permit moving groups of students from one location to another for varying activities. Another probable adjustment will be the establishment of instructional resource centers, one for each subject, to

be supervised by a teacher or lay person. The library will be the hub of this plan. We recognize that a program of this sort needs to operate at least two more years and then be thoroughly reevaluated before final valid conclusions can be drawn."

II Music Curriculum in a Five-Period Day

The Toledo (Ohio) Devilbiss High School (2,000 students), which has an excellent music program, functions on a five-period day, with a homeroom, lunch period, and class activity period inserted in the middle of the schedule. This apparently provides the desired flexibility for music scheduling.—RHK

<table>
<tr><th></th><th>Music Teacher A</th><th>Music Teacher B</th></tr>
<tr><td>9:00–9:25
(Homeroom)</td><td>Freshman Boys
Glee Club</td><td>Homeroom</td></tr>
<tr><td>9:30–10:25</td><td>Study Hall</td><td rowspan="3">Elementary
Instrumental</td></tr>
<tr><td>10:30–11:25</td><td>Girls Chorus</td></tr>
<tr><td rowspan="4">(Lunch
Period)

11:30–1:25</td><td>Sophomore Choir</td></tr>
<tr><td>Freshman Girls Chorus</td><td>Lunch</td></tr>
<tr><td>Senior Ensemble</td><td>Senior Theory (Planned)</td></tr>
<tr><td>Lunch</td><td rowspan="2">Band</td></tr>
<tr><td>1:30–2:25</td><td>Upperclass Boys
Glee Club</td></tr>
<tr><td>2:30–3:30</td><td>Advanced Choir</td><td>"B" Band (Planned)</td></tr>
</table>

Description

This is a high school schedule on a five-period day involving a homeroom period and four lunch periods. All classes meet daily.

Part of this schedule is in progress; other parts are in a planning stage. Orchestra, which is not marked on the schedule, meets at 8:00 a.m. in a before-school class.

III An Experiment in Team Teaching Music: Kindergarten Through High School

Since the Laboratory School of Indiana State University (Terre Haute) is an experimental center, it is essential that considerable flexibility be provided. This, however, does not seem to interfere with its major objective of creating "a continuum of music experiences which extend from the kindergarten to senior high pupils."[2]

Demonstration lessons for entire college classes are scheduled with laboratory school classes and later discussed in class meetings. In addition, small groups of children are brought to college classes for demonstration purposes.

There are five music specialists on the combined school staff, and they function on a six-period schedule or five-period assigned day. Periods are seventy minutes in the junior and senior high schools (400 students altogether), and classes meet four times per week.

The junior high schedule follows the block-of-time concept. There are no study halls in either the junior or senior high schools. Study time is under the supervision of the classroom teacher.—RHK

The Framework[3]

In the Laboratory School music education center, we are experimenting with and evaluating the subject of an adequate program. Here, we must provide for college and Laboratory School pupils in a three-way track which operates and interacts continuously.

Let us consider first the music education major: Steeped in applied music, he must, as a junior and senior, make adjustments to and for the child before student teaching. This must take place as quickly as possible; and the methods class can be the bridge for this transformation. An involvement with children within music experiences can be accomplished in a variety of situations depending upon the participant's individual interests. He may choose a whole class situation, a small group, or an individual student; and the period of time may range from a class period to a few minutes. In adjustments of this kind, the music major realizes responsibility before student teaching; and those students who have student teaching experience before methods have a realization in depth of their inadequacies when they return to methods class and can plan their own objectives in the same kind of involvement with children. Thus theory and practice join in a most meaningful way.

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[2] *Living Music Education.* (Music Education Center Laboratory School, Indiana State College, Terre Haute), p. 3.

[3] *Ibid.* p. 5.

The Junior High School

Junior high school students are divided into two groups for music: those with average or above-average musical ability and those with average to below-average musical ability. Each group meets twice a week for seventy minutes, and each group is team-taught by three staff members who try to provide musical experiences commensurate with their level of ability. By team-teaching we are able to provide each student with two different music experiences; that is, wind instrument instruction and listening, string instrument instruction and listening, choral instruction and listening, or

MUSIC EDUCATION CENTER — First Semester Schedule

Time	Teacher 1	Teacher 2	Teacher 3	Teacher 4	Teacher 5
8:00–9:10		Choral–General* T,W,Th,F	Individual Strings* T,W,Th,F	String Ensemble* T,W,Th,F	Instrumental Ens.* T,W,Th,F
9:30		Primary General Music T,F		Primary General Music M,T,W,Th	
10:00–10:50	Classroom Music Methods T,Th Special Ed* M,W	Elementary Methods for Music Majors M,W			Instrumental Methods for Music Majors M,T,W,Th
11:00–11:50	Choral–General Methods for Music Majors M,T,W,Th			Primary General Music M,T,W,Th	
12:00–12:50		Classroom Music Methods M,T,W,Th	Classroom Music Skills M,T,W,Th	Elementary Orch.*	Dance Band*
				Intermed. Strings M,T,W,F	Intermediate General Music and Winds M,T,W,F
12:45–1:55	Classroom Music Methods T,W,Th,F		Classroom Music Skills T,W,Th,F	Jr. High General Music Th	Jr. High General Music Th
2:00–3:10	Junior High Choral General Daily	Primary General Music T,Th Special Ed* T,F		Junior High Strings General Daily	Junior High Winds and Recorders Daily
3:00–3:50	After School Activi-ties	Classroom Music Methods M,W	Classroom Music Skills T,Th	After School Activities	After School Activities

*Laboratory School Classes

MUSIC EDUCATION LABORATORY SCHOOL — Second Semester Schedule

Time	Teacher 1	Teacher 2	Teacher 3	Teacher 4	Teacher 5
8:00	High School Choir T,W,Th,F	High School Winds T,W,Th,F	Conferences with college students daily	High School Madrigal W,F (9:00) College Class daily	High School Strings T,W,Th,F
10:00	Music 392 T,Th Fourth Grade M,F	Supervision of student teachers	Music 301 M,W	College Class T,Th	Second Grade Music—daily
11:00	Fourth Grade T,W	Supervision of student teachers	Music 301 T,Th	College Class M,W	Third Grade M,T First Grade W,F
12:00					
12:45	Fifth Grade T,Th Music 301 M,W	6th Grade Winds M,W 5th Grade Winds T,Th	Music 301 M,T,W,Th	Sixth Grade M,W	6th Grade Strings M,W 5th Grade Strings T,Th,F
2:00	Junior High Music M,W	Junior High Music M,W, Junior High Winds T,Th	Planning Period	Jr. High Choral T,Th Third Grade W	Junior High Music M,W Junior High Strings T,Th
6:15	Music 402, 502 T		Music 395 M	College Class T,W	

any of these in combination with recorder and fundamentals of music. We try to gear the experiences of the students with average to below-average musical ability to their level, at the same time attempting to provide them with as broad a basis of musical experience as they can assimilate. Students are scheduled for physical education on the three days they do not have music.

The Senior High School

Students in grades nine through twelve are offered music one period per day. All phases of the music program are offered during this period.

The senior high school schedule follows a three-track program: students are offered (1) instruction in strings, (2) instruction in winds, and (3) instruction in general chorus. Because the Laboratory School is relatively small (about 260 students in grades nine through twelve) a high degree of student utilization is necessary. Thus it is possible for students to participate in strings and winds, winds and chorus, and chorus and strings during

the single period of seventy minutes. Each teacher works in his own area of specialization with each teacher providing a general music experience in conjunction with his own specialty.

A high degree of teacher cooperation, based on a common desire for children to have breadth as well as depth in their music experiences, is necessary if this kind of scheduling is to work well.

IV An Instrumental Schedule for a School District

This report deals entirely with the instrumental schedule in Spring Branch (Texas), which has a total school population of 24,000 students in the junior and senior high schools. The Spring Branch music schedule merits attention for its utilization of personnel in both the junior and senior high schools. In this district, the high school functions on a six-period plan, and the junior high schedule contains seven periods.—RHK

Secondary School Instrumental Schedules

Our method of scheduling is rather traditional, having grown from a beginning of two music teachers leading all band and chorus classes in two secondary and six elementary schools. Since that beginning, the sixth grade has been moved to the junior high school, and all instrumental music is contained in the seven existing secondary schools with approximately 3500 students enrolled in band and orchestra and thirteen teachers on the staff.

All instrumental music teachers are itinerant and are scheduled by the director of music education. An effort is made to give all junior high directors the benefit of some high school classes and vice versa. It is believed that this is healthy in that it keeps the two levels in touch educationally and provides the director, who would ordinarily teach only sixth and seventh grades, with the opportunity to conduct a more advanced organization.

At one time it was customary to assign the advanced junior high director the second or concert band in a high school. This is rarely done now since the concert band has progressed to the point musically where it demands too much time. In most instances, we assign a director to the concert band and finish his schedule with beginner and preparatory bands. It is felt that each performing group needs a director who considers it his primary

High school level

Symphonic Band (1st) no limit
Concert Band (2nd) no limit
Cadet Band (3rd) no limit

Junior high level

Advanced Band (1st) no limit
Intermediate Band (2nd) no limit
Preparatory Band (3rd)—60 to 70 seventh-graders
Advanced Orchestra (1st) no limit
Intermediate Orchestra (2nd) no limit

Sixth-Grade level

Beginner Band—30 to 40 students
Beginner Orchestra—20 to 30 students

SCHOOL	8:00	9:00
Spring Branch H.S.	Home-room	SYM BAND Jensen
		ORCH Thomas
Memorial H.S.	Home-room	CADET BAND Clanton
Spring Woods H.S.	Home-room	CADET BAND Schmidt
Spring Branch J.H.S.	PREP BAND Fassino	BEG BAND Tucker
	INT ORCH Black	BEG BAND Black
Landrum J.H.S.	BEG BAND Lyon	PREP BAND Lyon
	BEG BAND Miles	
Spring Woods J.H.S.	BEG BAND West	ADV BAND West
	BEG ORCH Kull	ADV ORCH Kull
Memorial J.H.S.	BEG BAND Hyatt	PREP BAND Weaver
	BEG BAND Hyatt	

responsibility. (The first two high school groups and the first junior high group are all considered performing groups.)

Most of the foregoing concerns only band. Our orchestra program has not reached the point in enrolment where this type of scheduling is practical. However, the scheduling of orchestra will follow the same guidelines when size permits.

All advanced and high school orchestras are scheduled at the same period as the advanced or symphonic band. The most proficient band students are expected to perform in the orchestra. Also, orchestra directors may schedule winds twice each week without question. When circumstances require it, they may request and receive wind instrument students even more often. Naturally this requires understanding and cooperation from both band and orchestra directors and might not work in some schools. However, there is

SPRING BRANCH INSTRUMENTAL SCHEDULE

10:00	11:00	12:00	1:00	2:00	3:00 :30
	CONCERT BAND Lyon	CADET BAND Jensen			
	CONCERT BAND Hyatt				SYM BAND Clanton ORCH Thomas
	SYM BAND Schmidt ORCH Kull				CONCERT BAND Fassino
ADV BAND Tucker ADV ORCH Black	BEG BAND Clanton BEG BAND Clanton		BEG BAND Tucker BEG BAND Fassino	INT BAND Tucker	PREP BAND Tucker
ADV BAND Miles ADV ORCH Thomas	INT BAND Miles		PREP BAND Miles	BEG BAND Jensen BEG BAND Jensen	BEG BAND Miles BEG ORCH Kull
PREP BAND West PREP BAND Fassino	BEG BAND West BEG BAND Fassino		PREP BAND Schmidt INT ORCH Kull	INT BAND Lyon BEG BAND Weaver	BEG BAND Lyon BEG BAND Lyon
INT BAND Weaver	BEG BAND Weaver BEG BAND Weaver	PREP BAND Weaver INT ORCH Thomas		ADV BAND Hyatt ADV ORCH Black	BEG BAND Hyatt BEG BAND Black

a great spirit of cooperation between these people here and we have absolutely no problems with this.

Preparing Our Schedule

1. The primary job or class for the particular director is determined. This is done for each director and his name is placed in the appropriate slot on a blank schedule.
2. The remainder of the schedule is filled in keeping the following in mind:
   a. necessary travel time
   b. fair distribution of class load
3. An important consideration in assigning high school personnel is trying to schedule them in the junior high schools which send students to them. This is not always possible, but is done as much as feasible.

V Multiple Schedule Plan

The scheduling plan utilized by the Nathan Eckstein Junior High School (1800 students) in Seattle, Washington, makes it possible to involve almost one-half of the student body in instrumental and vocal activities. This is realized by a unique time schedule which includes a daily activity period; a multiple schedule of classes that provides additional time for certain subjects; before-school music classes (at 7:40 a.m.); and alternating classes involving certain music groups with other subjects.—RHK

In an effort to provide a greater opportunity for certain students to broaden their horizons through additional experiences, particularly in the humanities, and within the framework of the Seattle curriculum and time allotment, a Multiple Schedule Plan of classes is being conducted at Eckstein Junior High School. This effort involves approximately one-fourth of the seventh-grade class—or about 150 boys and girls who have shown by previous efforts in elementary school work that they have average or better ability to study and achieve effectively. These prerequisites for the program were selected because those involved in this schedule would not meet as frequently with their regular subject matter classes as they would in a normal schedule.

The schedule of additional subjects provided in the multiple plan includes:

1. Advanced instrumental and vocal music experiences not before available to talented seventh-grade youngsters.
2. Art appreciation (art history) tracing the development of art from primitive times to the present.
3. Reading enrichment.
4. Foreign language laboratory experience, which was previously limited.
5. Supervised study, where students can get additional help or study time as needed. (The latter was designed to be somewhat flexible when it was found that some students required additional study time during the week.)

The classes omitted once a week by students involved in this program are mathematics, language arts, social studies, and foreign language. No appreciable decline in accomplishment by these students was noted by the end of the first semester; and students and teachers are almost unanimously in favor of continuing the experiment. Unsolicited comments from parents and pupils add to the feeling that the program should be expanded to include the eighth grade.

Eckstein, like most Seattle junior high schools, has long been committed to a six-period day with teachers meeting five classes during this time and having one period for preparation. The multiple schedule does not infringe

on the teaching time, nor does it deprive teachers of their necessary preparation period. Additionally, it does not bring about a greater teaching load, even though several classes (art appreciation in particular) will average about sixty-five students per period. This is due to the flexibility of this type of program, which enables a teacher to be released to assist with the large groups.

The rearrangement of classes is made possible by designating certain class periods on various days during the week as ones which will be affected. The only day not used is Tuesday, and the only periods unaffected are the second and fourth periods. The second period is not used because physical education, typing, and special music classes are offered at this time for seventh graders. The lunch periods occur during the fourth period, which is quite involved with the rearrangement necessary for three separate lunch periods.

The main advantage of the plan, of course, is flexibility. Schools have long felt the lock-step effect of the rigid, conventional type of school program. In addition, the recent emphasis on mathematics, science, and foreign languages has tended to accentuate the problem even more. Schools

ECKSTEIN MULTIPLE SCHEDULE PLAN

(Art appreciation, music, reading enrichment, language laboratory, and supervised study)

	Monday	Tuesday	Wednesday	Thursday	Friday
1					
2					
3					
4					
5					
6					

The rectangular boxes designate the affected periods.

Hourly schedule of periods

Special: 7:40 - 8:15
one: 8:40 - 10:00
Activity period: 9:30 - 10:00
two: 10:05 - 10:55
three: 11:00 - 11:50
four: 11:55 - 1:20
five: 1:25 - 2:15
six: 2:20 - 3:10

throughout the United States are departing from long-used, established procedures of school organization to achieve flexibility in their curricula.

Another advantage of the multiple plan is that it is possible to have two or more schools within a school, operating on different schedules, but yet on the same time schedule. For example, at Eckstein 150 seventh-grade students participate in this program while the rest of the class (about 450 students) follow the conventional schedule.

It is our hope by this variation to offer classes primarily in the humanities that were not previously available to students because of an inflexible schedule. We also feel that schools should reflect to some degree the needs of their communities. The residents of the Eckstein area are largely professional people with strong educational and cultural backgrounds. Our total program stresses the needs expressed by our community, and we—as a school—attempt to include them in their proper balance within the school curriculum. This objective has been well stated in a recent publication.[4] "We should seek ways to establish an interplay between the sciences and the humanities so that they mutually complement and fortify each other; from such a relationship we may hope for citizens who are educated in the full sense of the term—interested, inquiring, tolerant."

VI Music Education—Elementary Through High School

This report describes music schedules in the Ann Arbor Public Schools in Michigan. The Ann Arbor high school (3,000 students) operates on a six-period day with an additional lunch period and homeroom. In the junior high schools there are seven teaching periods plus the homeroom and lunch periods.

The elementary schools offer a variety of situations and follow no set pattern. Some utilize a team-teaching procedure and other schools have nongraded classes. However, in all of these situations the general music is taught by a music specialist at least once per week.—RHK

Our desire in Ann Arbor is to provide a musical experience for any student who desires it, whether it be in instrumental music or choral music. We do not screen our students to start nor do we eliminate them once they

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[4] American Council of Learned Societies, *Report of the Commission on the Humanities.* (New York. The Council. 1964), p. 21.

have entered the program. If they wish to drop, it is entirely their choice. We hope to develop in our youngsters a love and appreciation of music. Our goal is not to develop a high school band or orchestra, but to provide a music education for the children in their general program.

All of our students in the secondary schools are scheduled by computer, and if we give the machine the proper kind of information, it does the right kind of job for us. Our whole high school of 3,000 students was scheduled in something like fifteen minutes this past year.

Elementary Music

General music is taught by a music specialist once a week in all elementary classrooms, kindergarten through sixth grade. The music specialist serves as a guide, assistant, and resource person to the classroom teacher; and the classroom teacher has the main responsibility for teaching music the rest of the week. The music teacher also conducts a non-select third and fourth grade chorus and fifth and sixth grade chorus. Here again, there is variation. Some schools will have separate choruses, non-select, for each grade level. A few schools even have choruses for grades one and two. When the children have chorus, they do not have music in their rooms.

The following is a portion of a bulletin sent to elementary classroom teachers as part of their orientation program:

ANN ARBOR PUBLIC SCHOOLS
ELEMENTARY SCHOOL CLASSROOM MUSIC

1. *Partial Statement of Music Department Philosophy*

Music has become an integral part of the life of the American child—in school, at home, and in the community. Great philosophers and educators of all times have recognized its importance in education, but most eras and most parts of the world have made it available only to children from families of favorable economic status. It remained for the American public to demand music for *all* children. Out of this demand has come increasing attention to the appreciation and study of music as a fundamental part of the school curriculum. The avowed purpose of all music education is the development of love and appreciation of music.

2. *Music is an Important Part of the General Education of the Students in the Elementary Schools of Ann Arbor*

Social Studies, Science and Health
Language Arts
Arithmetic
Music
Fine and Industrial Arts
French (4, 5, 6)
Physical Education (4, 5, 6)

3. *Two Programs in Music in the Ann Arbor Elementary Schools*

A. General Music Program—taught by the classroom teacher and assisted by the vocal music teacher (K-6)

B. Instrumental Music Program—taught by the instrumental music teacher (5-6)

4. *Music Curriculum is Varied*

Song Singing	Listening Lessons
Song Reading	Creative Activity
Rhythmic Activity	Instrumental Activity

5. *General Speaking, There are Two Ways of Teaching Music in the Elementary Schools*

A. Classroom teacher teaches all the music with an occasional visit from the music teacher.

B. All music is taught by a music teacher with no assistance from the classroom teacher.

6. *The Ann Arbor Program*

Our program is a combination of the two. The music teacher visits each classroom for 25 minutes per week. The classroom teacher has the responsibility for teaching music 25 minutes daily the other three to four days, depending upon the grade level.

Typical Classroom Music Schedule, K-2

Monday	Tuesday	Wednesday	Thursday	Friday
classroom teacher	classroom teacher	music teacher	classroom teacher	classroom teacher

Typical Classroom Music Schedule, Grades 3-6

Monday	Tuesday	Wednesday	Thursday	Friday
classroom teacher	music teacher	classroom teacher	classroom teacher	chorus music teacher

Chorus is a community singing period for fifth- and sixth-grade students and is conducted by the special music teacher. Some schools have choruses in the lower grades.

Plan may vary from building to building, depending upon facilities, type of educational program in the school, and many other factors.

7. *Role of the Music Teacher in Assisting the Classroom Teacher*

The music teacher serves as a guide, resource person and assistant to the classroom teacher.

Elementary Instrumental Music

The following bulletin identified the nature and scheduling of instrumental classes in the elementary schools of Ann Arbor:

THE SCHEDULING OF INSTRUMENTAL MUSIC

There are two ways in which instrumental music teachers may be scheduled in the elementary schools of Ann Arbor: (1) A single teacher who does all the teaching; (2) Teacher teams in which the responsibility is divided between two or more teachers with one of the teachers "in charge" of the instrumental music activities in a particular school.

A teacher team may consist of two to four teachers, all of whom come to the elementary school at about the same time. This requires two to four rooms for teaching. Such rooms as the following have been used: music room, auditorium, library, clinic, teachers' lounge.

There are advantages and disadvantages to either system. Below are some points worth considering.

Teacher Team

1. Teams take less school time. Two teachers can do in half the time what it takes one teacher to do, and four teachers take one-fourth the time.
2. Many students are gone from the classroom for a short period of time.
3. Teachers have an opportunity to teach in their major areas: brass, woodwinds, strings.
4. Students will usually have a different teacher each year. This can be a factor in dropouts because the new (to the student) teacher is a new personality to the child. This may cause discomfort to certain students.
5. There is often quite a variance in teaching procedures between teachers although the "teacher-in-charge" strives to coordinate all instrumental music activities in one building.
6. Takes more school space in terms of number of rooms.
7. A good deal of time is spent in travel by many people.
8. Teachers feel insecure because they have no real "home-base" when they are teaching in eight to ten schools.

Single Teacher

1. The single teacher has an opportunity to know all of the students as well as their parents over a two-year period. This makes for a very strong teacher-pupil relationship.
2. Should the teacher also be teaching in a junior high school, this system provides five years of close contact with the pupils and makes possible five years of guidance in many other areas than music.
3. There is a consistency of teaching procedures in one building, of demands on the student, of relationships with fellow teachers and parents.
4. Takes less school space in terms of rooms.
5. Little time is spent in travel from school to school by each teacher.
6. Takes more school time.
7. A few students are gone from the classrooms at one time.
8. The teacher must have a good knowledge of all the instruments—woodwinds, brass, and strings.
9. The teachers feel more security because they feel they "belong" to a few schools.

Regardless of the system in which instrumental music is scheduled (teacher-team or single teacher), students may be scheduled into a class by one of two methods: (1) homogeneous (like instruments, such as all

clarinets) or (2) heterogeneous (mixed instruments, such as clarinets, flutes, etc.). Because of large class size, homogeneous classes are usually scheduled in the larger elementary schools. Heterogeneous classes are scheduled in the smaller schools in order to make the best use of the teachers' time.

Class sizes for groups range ideally from eight to fifteen students. It is sometimes necessary because of types of instruments to have fewer than eight in a class, but this should be the exception to the rule.

Most beginning classes meet twice weekly. Advanced players have orchestra and one advanced instrumental class weekly. Classes are 30 minutes in length, while the orchestra may meet for a longer period (30-45 minutes).

Small-Sized Schools

The schedule for a small-sized school (those which have combined fifth and sixth grades or one fifth and one sixth grade) requires four hours per week.

Classes	*Time Allotment*
Beginning winds	Two 30-minute periods
Beginning strings	Two 30-minute periods
Beginning drums	One 30-minute period
Advanced winds and percussion	One 30-minute period
Advanced strings	One 30-minute period
Orchestra	One 30-minute period

Medium-Sized Schools

The schedule for a medium-sized school (one which has a total of three to four fifth and sixth grades) requires six hours per week. With two teachers, this schedule will take three hours; with three teachers it will take two hours.

Classes	*Time Allotment*
Beginning woodwinds	Two 30-minute periods
Beginning brass	Two 30-minute periods
Beginning percussion	Two 30-minute periods
Beginning strings	Two 30-minute periods
Advanced woodwinds	One 30-minute period
Advanced brass and percussion	One 30-minute period
Advanced strings	One 30-minute period
Orchestra	One 30-minute period

Large-Sized Schools

The schedule for a large-sized school (one which has a total of five or more fifth and sixth grades) requires eight hours per week. With two teachers this schedule will take four hours, with three teachers it will take

slightly more than two and a half hours, and with four teachers it will take two hours.

Classes	*Time Allotment*
Beginning flute	Two 30-minute periods
Beginning clarinet	Two 30-minute periods
Beginning brass	Two 30-minute periods
Beginning strings	Two 30-minute periods
Beginning percussion	Two 30-minute periods
Advanced flute	One 30-minute period
Advanced brass	One 30-minute period
Advanced percussion	One 30-minute period
Advanced strings	One 30-minute period
Orchestra	One 30-minute period

It should be remembered that the above schedules are basic patterns. Depending upon an imbalance of certain instruments, it may be necessary to vary the grouping of the classes according to the types and number of instruments. However, this will not change the total amount of time given to instrumental music.

Summary

The Ann Arbor Public Schools begin instrumental instruction in the fifth grade. The schools supply most of the instruments and roughly seventy percent of the total fifth grade enrolment receives instrumental instruction.

The students receive two 30-minute lessons per week, usually during school time. In the sixth grade, students receive one 30-minute instruction lesson and one 30-minute orchestra rehearsal on school time.

The Junior High School Music Program

In junior high school, all students are required to take one year of music. Thus, about seventy-five percent of the student body takes some form of music—general music, instrumental music, or chorus. If they are in instrumental music (which involves thirty to thirty-five percent of the student body) they are excused from general music.

The key to scheduling in the junior high schools is that courses such as industrial arts and home economics meet on alternate days and are required for only one year. The instrumental music program also meets on alternate days, making it possible to schedule a student in instrumental music with another course, such as Conversational French.

Ninth-grade study hall or ninth-grade physical education is scheduled against concert band and concert orchestra so that top wind players from the band may go to orchestra. With the cooperation of the physical education staff, students are permitted to attend two different physical education periods. The bands meet full (concert band) on Monday, Wednesday,

and Friday with a woodwind section on Tuesday and a brass section on Thursday. Those people who are in the orchestra are not required to come to the sectional, but go to orchestra instead another period of the day.

The junior high school orchestras hold full rehearsal once a week, string orchestra twice a week, and sectional one day a week. The best wind players from the band are invited to participate in the orchestra, a practice which has been very successful.

High School

The high school is not difficult to schedule as both band and orchestra meet at the same time. This means, of course, two different directors. The high school band meets in full rehearsal three days a week, and Tuesday and Thursday are used for sections with the best wind players from the band joining the orchestra.

Choral Music in the Secondary Schools

There has been no difficulty in scheduling choral groups with the exception of the junior high school. Unfortunately, both choral music and instrumental music are scheduled for the same time period, so that students can participate in only one activity. However, depending upon the student's schedule, it is possible to do both at the high school.

VII Music Curriculum in a Nine-Period Day

The Columbus, Ohio, secondary schools operate on a nine-period day, forty minutes a period.—RHK

The nine-period day has been very successful in the Columbus junior and senior high schools and has offered the following advantages:

1. The problem of long lunch periods is eliminated.
2. Pupils are able to elect more nonacademic subjects than were previously possible.
3. From the principal's point of view, music scheduling is easier.

Significantly, these advantages in the Columbus schedule are making it possible to build a strong music program.

How does the scheduling work? In the case of instrumental music, it has been found that large performing groups must dictate the scheduling. The administrators feel that they are the most important single-period subjects in the school day; therefore, these groups are scheduled first.

COLUMBUS PUBLIC SCHOOLS

TEACHERS DAILY PROGRAM

TEACHER Morgan, Ruth BLDG. Whetstone High School 1st SEMESTER Sept. 1964-65

PERIOD		REG.	1	2	3	4	5	6	7	8	9	Number of Pupils Taught Each Day	Number Daily Teaching Periods
CLOCK HOURS		8:45 9:00	9:03 9:43	9:46 10:26	10:29 11:09	11:12 11:52	11:56 12:36	12:40 1:20	1:24 2:04	2:07 2:47	2:50 3:30		
ROOM NUMBER		158		158	158		158	158	158	158	158		
Mon.	Subject	Reg.	CONFERENCE	Special	Sr. Choir	LUNCH	Boys	Girls	Jr. Girls	Theory	Jr. Choir	317	6
	Grade	10		Assignment	10-12		Ens.	Ens.	Glee I	11-12	10-11		
	No. Pu.	28			100		13	17	54	20	113		
Tue.	Subject		CONFERENCE	Sr. Girls	Boys Glee	LUNCH			Jr. Girls		Special	269	6
	Grade			Glee	10-12				Glee II		Assignment		
	No. Pu.			87	66				66				
Wed.	Subject		CONFERENCE	Special	Sr. Choir	LUNCH			Jr. Girls		Jr. Choir	317	6
	Grade			Assignment	10-12				Glee I		10-11		
	No. Pu.				100				54		113		
Thu.	Subject		CONFERENCE	Sr. Girls	Boys Glee	LUNCH			Jr. Girls		Special	269	6
	Grade			Glee	10-12				Glee II		Assignment		
	No. Pu.			87	66				66				
Fri.	Subject		CONFERENCE	Sr. Girls	Sr. Choir	LUNCH			Special		Special	237	5
	Grade			Glee	10-12				Assignment		Assignment		
	No. Pu.			87	100								

Single conflict subjects (that is, only one period of each is offered in the curriculum) are programmed next. They include subjects such as physics, trigonometry, advanced theory, and third-year shorthand. Classes that can meet two or more times a day are then scheduled. (Incidentally, the nine-period day allows three periods per day for subjects that conflict.)

A wide range of music electives is possible under a nine-period day plan. Using this schedule, ten periods of music per week are considered a reasonable number for a pupil. Fifteen may be scheduled with permission, and in exceptional cases eighteen periods are permitted, although not recommended since there are other subjects worthy of election.

In the Columbus program, secondary music teachers are requested to submit to the principal lists of pupils for preliminary scheduling in specific music groups, such as band, orchestra, choir, and boys' and girls' choruses and ensembles.

The choral schedule is set up to avoid conflicts with the major instrumental groups at the school. Consideration is given to the idea of selecting periods when most of the students are available.

The class in general music, the ninth period, is called "junior choir" to erase the stigma attached to the phrase "general music."

A Special Activity

As a worthy adjunct to the music program, five teachers at Whetstone High School (1,200 students) voluntarily conducted an evening humanities seminar for senior students. The class met one hour each week at the school, and teachers of choral music, art, theater, literature, and Greek history volunteered their services for this class.

One teacher from the team was responsible for each meeting with the rest of the team assisting. The approach was through the humanities. Course content and instruction were kept on a high cultural plane. The students were not only satisfied with the seminar, they wanted more.

VIII Music for the Sixth Grade

The Leawood Elementary School, with nearly 850 students, is located in Columbus, Ohio.—RHK

Music is a daily experience for sixth-graders in Leawood Elementary School. Operating under the self-contained classroom plan, the school features five 30-minute music periods a week. The three sixth-grade teachers meet as a team and plan the lessons together so that the three classes main-

tain similar levels of development. Once every two weeks the three classes meet for a special music session.

The first six weeks are devoted to theory and the study of notation. Tuned resonator bells are used to develop note reading ability. The class does some singing in conjunction with the theory study, but singing is not emphasized. Rhythm instruments such as bongo drums, sticks, triangles, cymbals, and maracas are used in the study of time and rhythm.

During the second six weeks, a more concentrated program of singing is introduced with an aim to improve tone production. Theory is continued with the addition of legitimate band and orchestra instruments. (Instruction in band and orchestra instruments is offered initially in the fifth grade.) The pupils playing instruments perform alone, accompanied by the singing, and play with the bell choir. The resonator bell choir is composed of pupils from the three sixth-grade rooms.

The dancing phase of the program is coordinated with the physical education activities. One year, waltzing was taught to the sixth graders by the fourth graders. In response, the sixth-grade instrumental combo played the waltz accompaniment for the fourth grade dancing. This was strictly an interclass project at Leawood School and was most educational and interesting for the children, who were completely happy with their music work.

All phases of the singing, theory, listening, and dancing experiences are continued throughout the school year with interesting and meaningful implementation.

IX Music Curriculum in a Six-Period Day—Junior through Senior High School

The Kalamazoo (Michigan) secondary schools consist of five junior high schools, ranging in size from 650 to 900 students, and two senior high schools, 2,200 and 1,500 students respectively. At the time of this report, they functioned on a six-period day—fifty-five minutes per period in both the junior and senior high schools. Since the report the Kalamazoo schools have changed to the moderate, or lengthened day, plan.—RHK

General music is required of all seventh-grade students 2.5 periods per week. Some schools break this into twenty-five minutes daily opposite language classes of the same length.

Instrumental students (beginning and advanced) receive the equivalent of one fifty-five-minute period weekly for class lesson and/or ensemble instruction from the general music class. Both instrumental and vocal (gen-

eral music) teachers "team teach" basic music knowledge and lead any class performance and discussion. In addition, films, instrumental listening, and historical study are all offered in the general music class. Students receive one *composite* grade (instrumental-vocal) for music.

In the eighth grade, students may elect five 55-minute periods of music weekly, or may combine language and music on a 2.5 basis as in the seventh grade. Instrumental students again receive the equivalent of one or two periods of class lesson and ensemble instruction, depending upon whether they elect *music and language,* or *music* as a full-time subject. Team teaching continues and a composite grade is again given.

Ninth-grade students elect five periods of music weekly and receive two days of instrumental if they choose. The concept of team teaching and composite grading continues with the emphasis on music as a multiple experience with many facets.

Junior High Bands, Orchestras, and Glee Clubs

These groups meet before school for forty-five minutes either two or three times weekly in accordance with the plans and wishes of the director. Often band will be offered three times the first semester and twice the second against orchestra, or vice versa. Training groups, such as "B" band, frequently meet after school, although some directors prefer assigning the fifth morning to the beginning band. (Incidentally, teachers receive extra pay for extra service.)

All groups cut across grade levels, permitting membership according to ability.

Senior High Bands, Orchestras, Choirs, Major Music, General Music, and Humanities

All classes meet five days a week in 55-minute periods. The larger high school permits instrumentalists who wish to sing to continue the two day-three day pattern of the junior high schools. For example, a student may elect to sing three days and play two or vice versa in band-chorus. Our smaller high school theoretically offers this plan but has not actually implemented it. Both schools permit instrumentalists to make substitutions, that is, band for physical education, orchestra, and/or chorus in place of study hall.

Incoming sophomores are auditioned in the previous spring for "A" band and orchestra while incoming vocalists are not auditioned but are admitted in terms of experience. These students fall into categories such as:

1. Those with no music since seventh grade—*General Music*
2. Those having taken either or both eighth- and ninth-grade music—*Chorus*
3. Those of exceptional singing ability are auditioned if vacancies exist in sections—*Advanced Choir*

X Elementary School Music in a Self-Contained Classroom

Rufus Putnam Elementary School is a laboratory school of the Ohio University in Athens, Ohio, and contains 160 students in grades one through six. Music is taught in this special elementary school by both music and classroom teachers. To integrate the music program with academic units, the music teacher and classroom teacher work closely together.—RHK

At Rufus Putnam, all children have twenty minutes of general music instruction four days a week with a special music teacher. Instrumental instruction is additional. Classroom teachers are competent and interested in using music as a part of the integrated classroom program so that music becomes a part of many of the classroom units of study.

There is a specially equipped music room, where children are free to experiment with a range of music instruments and materials. The students are also free to browse or seek reference materials in a well-stocked (music) library. Grade-level books on music and library music books are also available in the classroom.

The laboratory school emphasizes the importance of the individual, and flexible scheduling is therefore necessary. Large group experiences, individual learning opportunities, and special instrumental and vocal music experiences are planned to implement the classroom and special music room learning experiences. A sample schedule is illustrated below.

Grade I	9:00 - 9:20	T, W, Th, F
Grade II	9:30 - 9:50	T, W, Th, F
Grade III	10:00 - 10:20	T, W, Th, F
Grade IV	10:30 - 10:50	T, W, Th, F
Grade V	11:00 - 11:20	T, W, Th, F
Grade VI	11:30 - 11:50	T, W, Th, F

Additional individual or large group music instruction to complete the 100-minute per week requirement in Ohio schools is achieved in the classroom, in auditorium sessions, in concerts by the university symphony orchestra or the university band, or in the individual work as described above.

Special instrumental music lessons, the elementary orchestra, and other programs are not included in the above regularly scheduled music instruction. They are supplementary, and additional time is allotted for these activities.

XI Modular Scheduling in Music

This article, written by Earl C. Benson, originally appeared in the December 1967 issue of the Music Educators Journal—*RHK*

Schools throughout the State of Minnesota may be affected by the results of a pilot program that is being conducted during the 1967-1968 school year in one of the junior high schools in Bloomington, a suburb of Minneapolis. Students there are experiencing a new concept of scheduling, the Stanford School Scheduling System. This article briefly describes this system and its implications for the Bloomington school.

Under this program, commonly called "modular" scheduling, the school day no longer consists of six or seven hours and the same number of classes. Instead, each day is divided into sixteen twenty-five-minute modules that are computer-scheduled to utilize time and space efficiently and to allow individual student schedules to be diverse in content. Individual periods of time are called "modules," or "mods." These modules may either be grouped or separated, depending on the desires of the staff and administration. Each music group is scheduled differently; band rehearsals are two mods (fifty minutes) long, and choral rehearsals that meet more frequently are one module in length. This scheduling decision depends on the needs of the individual instructors and their time requirements.

Students are scheduled into structured classes about sixty percent of the school week. This time is spent in large group lectures, laboratory groups, medium groups (band and choral rehearsals), small group discussions, and lunch. The remaining time, called "independent study," varies from day to day. Each student is responsible for his own study habits and can develop them in whatever way he feels will make him a better student. This study might involve research in the resource center or it could be done in the woodshop, using tools that are not readily available after school hours. He could also utilize this time by practicing in the bandroom or seeking individual help from his mathematics teacher. Students are not restricted in their independent study time unless they begin to lag in other subjects. When this occurs, teachers may schedule them back into their classes for additional help. Each instructor can schedule a student back for only one-half of the student's structured modules with that teacher. For instance, if band meets ten modules a week for five fifty-minute periods per week, the director can bring a band member back for five mods a week. However, this obviously cannot be done on a regular basis.

The music program in a school of this type may employ these modules in a variety of ways. The large group rehearsals can be the same as in the traditional schedule or their length may vary from day to day. The most apparent advantage in the Bloomington music program is in the use of independent study time. Forty percent of each student's time can be spent

as he deems advantageous. For instance, he may ask the band director for individual help or sectional rehearsals. Modular scheduling permits the band director to work with each of his students at some time during the school week. Formerly the time pressure created by the school's three bands did not allow for such individualized instruction. The music rooms become laboratories for students who wish to use them. A trumpet student who wishes to become proficient on his instrument can now practice during school time without interfering with after-school athletics or after-dinner activities. This practice time is further enhanced by the presence of a professional music educator who supervises the efforts of his students.

The disadvantages of this type of program are few. Correlating individual student schedules to set up a sectional rehearsal requires time, but it can be done. The major disadvantage is that occasionally forty or fifty students practice at the same time in the bandroom. To any outsider, this conglomeration of sounds may be rather nerve-shattering; however, from the standpoint of producing a "big" sound, it is essential to survival. If that sound is not big, it will never be heard.

The peaceful day, with a free hour for coffee or tranquil time in one's office, no longer exists. The two hundred students of the Bloomington band have been scheduled to allow at least some of them to practice at every school hour of each day. To close the doors would be to deprive a student of the help he needs. The director must arrange his schedule to benefit his own needs, both musically and philosophically. The bandroom is a virtual beehive of activity each day as students seek to improve their musical abilities. The tug on your coat every few minutes from the little fellow who wants help is a rewarding experience that many music teachers have possibly not realized.

Instructors' schedules are similar to their students' in that they are not closely structured into classes. With about fifty percent of his time to spend in his resource room, the teacher is readily available to work with groups and individuals who desire it. This time may be used in answering questions that involve too much time to be explained in large group rehearsals. This is the time when Mary learns just how fast the mordent in that new composition must be played, or when John, the slow clarinetist, receives help in mastering the break.

The serious student, who is also frequently a scholar, can use this time, as in fact many do, to practice solo and ensemble compositions. Seeing students practice one to two hours each day is not an uncommon occurrence. With this amount of work during the course of each week, students can develop into fine musicians if they are given the proper help.

Ralph Waldo Emerson, when approached on the subject of change, said that every revolution was originally a thought in one person's mind, and that each reform was once a private opinion. This is the essence of the

flexible scheduling program. It is indeed a change from the traditional way of education, but it is optimal for providing the best musical education for students. Instituting a program such as this requires the continuous efforts of a dedicated administration, staff, and pupils. Its shortcomings may be many, but its rewards will be abundant. With any innovation, unforeseen problems may arise. The Bloomington program will be constantly revised. It will be scrutinized by the entire staff, who will make recommendations for its improvement at many times during the year. If this program meets the expectations of those concerned, then the quality of the education of the pupils could be greatly improved.

CHAPTER THREE

Data Processing and Computer Scheduling

"A superficial reason for the current interest in flexible scheduling is the availability of new mechanical aids to the schedule maker. School administrators, like many other persons, enjoy working with gadgets. That there is a real danger in confusing speed and flexible scheduling was pointed out by this writer some years ago: 'Modern electronic data processing equipment can be a boon to the further development of quality in education. It can also be used to do faster what should not be done anyway and thus delay or forestall changes that could improve dramatically the services of schools to individual students.' "—*J. Lloyd Trump*

Data Processing and Program Planning
Gaynor Petrequin

Data processing is usually considered to be a very recent development. It originated, however, in the latter part of the nineteenth century. Dr. Hermann Hollerith, perfecting inventions by Babbage and Schuetz, developed the first application of the automatic punched card for processing data in the United States' census of 1890. Punched card methods using electromechanical equipment (data processing) have been used by industry and by the Federal Government since that time. To be sure, general use of this equipment in industry, in scientific research, and in government is a relatively recent development, namely, since World War II. During the last three decades many large universities have adopted mechanical punched card procedures, first for financial accounting and then later for registering and scheduling students.

Educational Data Processing

In the last fifteen years large public school systems have adopted data processing for school district business accounting. The first experimental use of the automatic punched card to process secondary school student

records appears to have been about 1947. From that time until about 1960, only a very small number of school systems throughout the country experimented with punched card procedures for processing high school records. The exceedingly slow development would appear to be due, in large measure, to the lack of adequate experimentation together with lack of detailed reporting of procedures, methodology, costs, and assessments, in terms of comparison with manual methods, in the few successful experiments.

From about 1960 to the present, educational data processing has made notable growth due in part to the successful pioneering efforts in a number of scattered school districts throughout the country together with successful exploitation and communication of these programs by representatives of data processing firms. Notable among these experiments was the program at Lincoln High School in Portland, Oregon, conducted by the writer from 1956 to 1960. Four general areas were developed in the Portland program: (1) registration and programing, (2) grade reporting and recording, (3) student attendance accounting, (4) miscellaneous listings and analyses. Success in all four areas was attained as a result of continued experimentation and refining of procedures.

This article will be limited to an exposition of the registration and programing functions from its inception to the present relatively sophisticated design pioneered by the *Stanford School Scheduling System* and implemented in several high schools, especially at John Marshall High School in Portland, Oregon.

The registration and programing function was the initial area selected for experimentation with machine techniques in the Portland experiment as this area was considered basic to all further student record keeping. This includes the collection and processing of selected personal data obtained from all students, the selection and forecasting of each student's subjects for the following year, the processing of these forecasts, the preparation of the master program based on the forecasts, the scheduling of the students according to the master program, and the preparation of teacher schedules, student schedules, and teachers' class lists.

The original registration and programing design—the scheduling procedure—developed at Lincoln High School was a combination of manual and machine functions. Data processing equipment was utilized and procedures were developed for many of the detailed functions of the scheduling procedure, but the main tasks of building the school master schedule and loading the students into it were still done manually.

Since 1960 programers for International Business Machines developed a fairly sophisticated "loading" operation called the *IBM Class Program*. This computerized system has now been perfected so that it is a fairly simple operation to schedule students into a manually-prepared, conventional

high school program and produce the necessary student schedules, class lists, and the like—all by use of data processing methods and equipment.

The Stanford Project

Actual generation of the school master program by computer was initiated by the Stanford School Scheduling Project in 1963 as the culmination of four years of experimentation to develop a computer program that could generate a flexible schedule which would break the conventional lockstep of high school schedules. The Stanford Project built four flexible schedules, more properly called "computerized modular schedules"—in August 1963 for Homestead High School in Sunnyvale, California; Lincoln High School in Stockton, California; Marshall High School in Portland, Oregon; and Virgin Valley High School in Mesquite, Nevada.

Although flexibility had been attempted in two or three medium-sized high schools in the country prior to this date, these hand-generated schedules were really sophisticated "block schedules"; but they did provide some degree of flexibility from the lockstep schedule.

The four schools working with the Stanford Project ranged in size from 160 students (grades 7 to 12) in Virgin Valley to 2,250 students (grades 9 to 12) in John Marshall; and there was a flexibility range from a limited program at Homestead to a fairly complex design at Marshall.

Problems encountered in the first year of implementation of the modular schedule were severe, due to the revolutionary and comprehensive nature of the new design. During the past three years, however, the Stanford School Scheduling System has improved immeasurably as has the sophistication of the high school staffs in implementing the innovative concepts inherent in the design. As a result, the computerized modular program at Marshall, along with the several other similar programs, has been validated in terms of an improved teaching and learning situation emphasizing the individual student.

A very brief overview of the Marshall program will attempt to show some of the advantages in scheduling by using computer data processing designs. A brief explanation of the instrumental music and art courses will illustrate actual possibilities for improving teaching and learning in the fine arts.

In planning the Marshall program the teachers structured their courses in the most effective manner they could conceive without the traditional restrictions of one hour, one teacher, and thirty students. Working within the parameters of twenty-one 20-minute modules, or periods, per day—comprising a weekly cycle of 105 modules—the staff created varying course structures forming small groups of six to fifteen students, laboratory-size groups varying from twenty to seventy students, and large groups of up to 375 with class time ranging from one module in the foreign language laboratory to six modules in one of the science laboratories. The number of meet-

ings per week in any one course ranged from one to six. They created over forty teaching teams of two to six members, expanded the use of audiovisual resources, utilized services of twelve paraprofessionals, and established resource study centers (departmental libraries).

Perhaps the most important concept underlining the Marshall program is "independent study." Students average approximately one-third of their school time outside of classes. During this time a student may do generally assigned homework, but beyond that may plan and carry out special study projects of his own selection meeting his unique needs, interests, and capabilities. All students, regardless of academic ability, have the opportunity for these experiences. The results have been truly gratifying to the staff. Original, creative projects beyond the expected performance of the student are continually being submitted with many crossing subject lines into two or more curricular areas. Individual teacher and student conferencing within the school day is an important part of the independent study program and is essential for quality independent study projects.

Modular Schedule for Music

A look at the structure of the instrumental program at Marshall will serve to indicate some of the advantages of a computerized modular schedule in the music area. The course structure as developed by the instrumental music teacher indicates the entire senior band as a unit meets three times a week for three modules (one hour) each time. In addition, the woodwinds meet once separately for three modules, as do the high brass, low brass, and percussion. Thus the instructor meets four separate subgroups of the band in addition to the entire group. Each student in the senior band meets with the instructor for 220 minutes a week. The student can also spend a varying number of modules, according to his needs, working independently in the practice rooms. The intermediate band, beginning orchestra, and advanced orchestra are also structured in somewhat the same manner with small homogeneous subgroups meeting separately in addition to two or three meetings as an entire unit.

A summary of courses in the art department as structured by the art instructors generally provides for one large-group meeting of two modules—primarily for presentations with audiovisuals on the history of art and art concepts—and one laboratory session of four modules. The student is also expected to spend four or more modules of time in the laboratory during his independent study time. Students will spend from two to ten modules at one time in this "open lab" phase of their art courses.

Perhaps it has become evident that a school schedule with course structure of the type indicated above cannot be built manually, particularly if the school is of any appreciable size. Data used for schedule building, whether manual or by computer, include: (1) teachers, (2) students, (3) physical facilities, (4) time, and (5) course structures. In a modular sched-

ule the combinations of these factors are in the millions. A computer is, therefore, obviously necessary in order to investigate the myriad of possible combinations it can do in a few seconds, to produce the best program considering each student's many course requirements.

It is of particular importance to understand clearly that data processing systems including computers are only tools (necessary in the case of modular schedules), which can profitably be used to generate either conventional or modular school schedules. Obviously data processing systems do not make educational decisions; these are the province of the educators. In-put data of the type indicated above must be provided in flawless form by the schools. The computer system, which has been programed to perform the horrendous detailed work necessary to construct varieties of schedules, then manipulates the data in accordance with the programing and produces the best possible master school program into which it schedules each student.

Among the advantages of a computerized modular program is one which is of particular significance to those concerned with the elective and fine arts areas. Experience of the several schools in the Stanford Project indicates that students on the average take one more subject in modular programs than in a conventional program. The additional subject being an elective has made it possible for more students (usually average and above in ability) to have worthwhile experiences in the fine arts. This is a development which music educators and others heartily support.

The utilization of data processing systems and particularly those which can program schools "flexibly" makes it possible to structure subjects in accordance with the subject requirement rather than by the same arbitrary arrangement for all subjects. In these rather complex designs students have more time on their own to follow areas of need and interest. Large group, small group, and laboratory sessions provide for better utilization of teacher and student time. Students generally have experiences in more areas of the curriculum than were formerly possible. Small-group discussions, independent study projects, and individual student-teacher conferences provide motivation and, above all, make it possible to really individualize teaching and learning.

Computers and Their Effect on Scheduling

John Blough and Donald Senter

Because there are many advantages, including a considerable saving of administrative and supervisory time, many school systems are considering the use of high speed electronic computers for scheduling high school pupils to classes. However, lack of experienced personnel, lack of equipment, and the complexity of the technology involved in computer programming pre-

sent obstacles to the initiation of an innovation of this kind, especially in an educational system which takes pride in the "personal touch." For the benefit of those who might profit by the experiences of others in surmounting these obstacles, a résumé of the experiences in computer scheduling of senior high school pupils in the Detroit Public Schools is given below.

In 1957 when it was decided to use computer scheduling of high school pupils, a steering committee was organized and a counselor with advanced training in mathematics was sent to the programmer training class run by IBM. With his acquired knowledge of programming techniques and his experiential knowledge of hand scheduling of pupils, the programmer was able to develop with the high school administrators a system of procedures and forms for the computer scheduling of pupils in two high schools, using the IBM 650 computer library program *Class Load and Student Scheduling* (*CLASS*). By the fall of 1965, twenty-three senior high schools were using the modified IBM 7074 computer version of the program. The student enrolment involved in the project totals approximately 50,000 with schools ranging in size from 280 students (one-half grade in newly constructed school) to 3,900 students in the largest school.

While the procedures and forms used in the preparation for the final scheduling of pupils fill a small booklet, the following brief outline suggests steps taken:

1. Each course offering in the school is assigned a logically constructed code number of three digits.
2. Each pupil is assigned an arbitrary six-digit code number.
3. Pertinent personal data and the code number of each pupil is keypunched on a pupil card.
4. Pupils make course selections on a specially prepared form identified by the pupil's code number. These data are keypunched as coded items on the pupil card and stored on magnetic tape as indicated in *Example 1* below.

Student Name—No.—Grade Names and Numbers of Courses Requested

King Catheri	Sen Lunch	Ex 9 Hr	Off Mach 1	Shnd4 Trs2	Econ Reg	Eng 8M	
030646—12A=8	399	390	194	188	059	022	
Kerr William	Sen Lunch	Ex 9 Hr	Band A	Bus Law	Geom 2	Econ Reg	Eng 8M
045234—12A=8	399	390	309	176	094	059	022
Kadich Timothy	Sen Lunch	Work- ing	Phy Sci 2	Sr Math 1	Econ C P	Eng 8M	
030655—12A=8	399	394	129	098	060	022	

5. Course selections are electronically processed to give tabulations of numbers of pupils for each class. *(Example 2)*

Example 2

OSBORN HIGH SCHOOL
Date 08-29-65

Detroit Public Schools
Form No. 1095

List of Remaining Seats and Class Sizes

Course No.	Course Name	Orig. Seats	Requests	Remaining Seats	No. Sections	Avg. Per Sect.
38	Drama 2X	38	4	34	1	4
40	Band A	80	59	21	1	59

Example 3

CENTRAL HIGH SCHOOL
Date 08-15-65

Detroit Public Schools
Form No. 1092

Study Hall and Master Schedule List for Verification

Record No.	Avail. Seats	Course No.	Course Name	Hour	Room No.	Days Met	Hour Pattern	Grade Patt.
43200	25	300	B Voice-1	7	316	MTWTF	07101	
43300	76	301	G Vocal-1	8	316	MTWTF	08101	18
43400	25	303	Vocal 4-6	6	316	MTWTF	06101	36
43500	50	304	B Glee 1-4	7	316	MTWTF	17101	18
43600	65	305	B Glee 1-4	2	316	MTWTF	02101	36
43700	65	306	Ensem 1-6	3	316	MTWTF	03101	36
43800	50	307	Choir 1-6	4	316	MTWTF	04101	36
43900	50	307	Choir 106	5	316	MTWTF	05101	36
44000	32	308	Inst Wind	8	332	MTWTF	08101	43
44100	60	311	Orch A 1-6	3	332	MTWTF	03101	18
44200	60	312	Orch B 1-4	5	332	MTWTF	05101	18
44300	90	313	Band A 1-6	4	332	MTWTF	04101	18
44400	50	314	Band B 1-4	7	332	MTWTF	07101	18
44500	25	315	Band S 1-6	2	332	MTWTF	02101	18

MAU	CHARLES	155938	M			11A
Last Name	First Name	I.D. No.	Sex	Hth.	CR.Hrs.	Grade

PAGET	CODY
Counselor	School

Course	Hr.	Rm.	Days
DIST ED 1	1	214	MTWTF
STBAND	2	130	MTWTF
ROTC 2	3	ROTC	MTWTF
LUNCH	4	LR	MTWTF
ABAND	5–6	130	MTWTF
ENGLISH 5A	7	E206	MTWTF
AM HIST 2A	8	326	MTWTF

ELECTION CHANGES

Course	Hr.	Room

COUNSELOR COPY

Machine prints three of these cards for each student, labeled COUNSELOR COPY, OFFICE COPY, STUDENT COPY. The actual size of the card is approximately 3" x 4".

Example 4

Example 5

DETROIT PUBLIC SCHOOLS — SOUTHEAST CLASS LIST

Subject Band A	Subj. No. 369	Section Number 04	Room Post	Hour 4	Days MTWTF	Page No. 1

Student Number	Last Name	First Name	Sex	Code	Counselor	CTMM	DAT	Step Scores Math.	S.St.	Rdg.	Scat Scores Verb.	Quan.
186207	Boden	Nancy	F		Littlefiel	11B		11–43	33–63	67–81	57–75	19–40
158369	Bryant	Isaac	M		Leonard	11B		35–66	28–58	09–20	19–40	36–63
158487	Carr	Della	F		Jones	10A		24–61	08–27	54–71	38–57	19–40

6. The school master program is constructed by the school administrator on the basis of this tabulation and stored on magnetic tape. *(Example 3)*

7. By means of the IBM *CLASS* program, pupils' course selections were fitted into the master program.

8. Class schedules *(Example 4)* and teacher class lists *(Example 5)* obtained as a result of the *CLASS* program are distributed to schools concerned.

Advantages

The chief advantage of computer scheduling is that it relieves highly trained and skilled counselors from many hours at the onerous clerical task of fitting individual pupils into a master schedule and writing individual programs. The time saved can be spent in professional activities of counseling pupils in their course selections and in other guidance functions. Time is also saved for pupils, teachers, and administrators in that set class size limits, once established, are adhered to. No period of reorganization is necessary for adjusting class sizes. Such a reorganization period is almost inevitable when six to ten different counselors individually hand-schedule pupils to fit a common master schedule. The printed lists give each teacher a class list of pupils in each of his classes before the first meeting of the class. He is also supplied with essential test data for each pupil—data which would take hours of search to find and record by hand. Information relating to such things as attendance in honors courses or the number of semesters a student has attended a specific course could be supplied also. This information could be used profitably by teachers.

Each pupil is supplied with a copy of his own program schedule, giving the course names, hour of meeting, meeting rooms, and day of the week, as well as having a place to record any election changes. Multiple printing of these pupil schedules supplies copies of the individual pupil's schedule for his counselor and for the central office.

Disadvantages

A common misunderstanding of the uninformed regarding data processing is that the computer is a giant "brain" capable of solving any and all problems. In truth, the computer is merely a slave mechanism performing functions as well as, or as poorly as, instructed. It cannot in itself decide between good data and erroneous material. It assumes all input is correct and reacts accordingly. This is the major source of difficulty in the computer scheduling. Too often, errors of transcription or misinterpretation result in reruns or output not quite as efficient as it should be. For example, last semester one problem occurring at two schools was the coding of multi-period classes. In the Detroit version of *CLASS*, the hour pattern is coded into a ten-digit number as shown by the following:

1st Hour	Length of Class	Days Met	2nd Hour	Length of Class	Days Met
01	2	01	00	0	00

This class would meet the first period (digits 1-2), for two periods (digit 3), each day of the week (digits 4-5). The last five digits are zeros indicating both periods are the same.

The error in this instance was that the length of the class (digit 3) was

coded as 1 instead of 2. When scheduling this class the computer "thought" it was a one hour class and scheduled another class into the second period.

Another multiple hour coding pattern would be as follows:

1st Hour	Length of Class	Days Met	2nd Hour	Length of Class	Days Met
03	1	01	04	1	02

This class would meet third period (digits 1-2) for one period (digit 3), each day of the week (digits 4-5). It would also meet fourth period (digits 6-7), for one period (digit 8), but only Monday and Wednesday (digits 9-10).

These particular classes were all coded as first and second hour classes (01 in digits 1-2 and 02 in digits 6-7). This "told" the computer that all multiple hour courses met the first two periods of the day only. As a result, we had all biology, chemistry, physics, and other multiple hour courses meeting in the first two periods.

In both instances, of course, corrections were necessary and the entire school was rerun.

Problems in coding room assignments or course selections also occur. Parents may find it less than humorous if their daughter's class in "Family Living" is scheduled to meet in the boys' locker room. A mistake in course coding may put a retarded reader into an advanced class in Latin.

Neither can a computer, unless specifically instructed to do so, make judgments and choices. The election by a pupil of two classes which meet at the same time, but in different rooms, presents an insoluble problem which can be resolved only by selecting the first of two conflicting choices (not necessarily the wiser choice) or by rejecting the pupil's subject selection card, IN EITHER CASE, THE PUPIL'S PROGRAM MUST BE EITHER REVISED OR THE PUPIL MUST BE HAND SCHEDULED. From five to ten percent of the pupils' programs require such special treatment, and hand scheduling negates, to a certain extent, the careful control of class sizes.

When conflicts occur, the information relating to a conflict is printed out and supplied to the counselor *(Example 6)*. The list contains the course

Example 6

CONFLICT LISTING
120920 SMITH STANLEY
CONFLICT 356 007

numbers of the courses in conflict, i.e., *3 5 6* is the numerical code for Band A, and it is in conflict with *0 0 7*, which is English I. The computer would be directed to choose the course with the highest priority, omitting the other. This particular student's schedule might have to be hand scheduled to resolve the conflict. The hand scheduling might involve transferring the student to another English I class already at capacity so that he could take Band A. A better solution might be to more carefully plan the master schedule. Band A might be scheduled at a double offering or at a time when required courses such as English are less likely offered. Conflicts in music classes are not the result of computer scheduling, but are based entirely on student choices and schedule planning.

Moreover, the very nature of a school makes it almost impossible to do scheduling far in advance of the beginning of a semester. Preliminary master programs fabricated on the basis of a count of course elections made two weeks before the close of a semester must be revised at the close of the semester to adjust for failures. Likewise, pre-planned master schedules for the opening of the school year must be revised on the basis of changes caused by pupils' successful completion of summer school courses. The time between the receipt of complete pupil data and the demand for completed schedules is very short, especially between the first and the second semester of schools having semi-annual promotion.

The scheduling of about 50,000 pupils requires around-the-clock work on several computers. Despite the difficulties outlined above, computer scheduling is being efficiently operated in the senior high schools of Detroit and in other school systems. Even small school systems are using the services of university computer centers to schedule high school pupils.

The Future of School Scheduling by Computer

Because of the ferment or revolution in education, new innovations to scheduling are needed. New concepts such as modular scheduling, team teaching, block time schedules, or scheduling by curricular areas ("house" concept) are being explored via the computer. In one of the new Detroit high schools encompassing only tenth graders (800 students), the "house" concept was initiated successfully. The business education courses consisting mainly of business arithmetic, shorthand-typing, and bookkeeping were treated as one three-period subject. Three separate class lists were issued—one to the business arithmetic teacher, one to the typing-shorthand teacher, and one to the bookkeeping teacher.

One-third of the listed students, selected randomly by the counselor, were put into business arithmetic the first period; the second third of the students were put into business arithmetic the second period; the last third of the students were put into business arithmetic the third period. The shorthand-typing and bookkeeping courses were rotated and treated in the same man-

ner. This principle of scheduling could be used profitably in scheduling any definite sequence of music or other classes.

As educational data processing becomes more sophisticated and as more and better programs are developed, the efficiency of school scheduling will increase. An example of this type of program is the *Generalized Academic Simulation Programs* (*GASP*), developed by the Educational Facilities Laboratories, which automates the production of the master schedule.

With increased knowledge of the psychology of learning and of pupil-teacher interactions, it may be possible through the use of the computer to give truly individualized student scheduling. Where there are enough classes and teachers, it is not inconceivable that types of pupils may be matched with the types of teachers with whom they can work most productively, or for the types of instruction best suited to their needs. For example, not all pupils respond equally well to instruction by television. Also, some pupils learn more efficiently under a subject-matter oriented teacher, while others need a teacher who is pupil-oriented.

Pupil guidance and pupil scheduling should go hand-in-hand. Guidance by machine alone is neither desirable nor possible. However, machines can be instructed to look up in their tremendous memory banks data which would be impossible for the counselor to keep at his fingertips. Computers can also be instructed to act according to the counselor's judgments, based on his specialized knowledge as applied to particular pupil and teacher traits. Thus the computer can enable the counselor to extend his guidance to include factors which might otherwise have been ignored because of the limitations of time and human fallibility.

Above all, scheduling by computer gives the counselor time for personal contact with pupils; it gives the teachers more time to teach—whether the subject matter be music or mathematics—and to use those skills for which they were trained and those talents which they have developed. It reduces the time spent in routine clerical duties, and increases the time for education.

Computer Scheduling: Resources and Design

Robert N. Bush and Donald DeLay

Stanford school scheduling efforts began as a three-year detour around a seemingly insurmountable barrier to curriculum reform—the traditional school schedule. In 1960, Professors Robert N. Bush, Dwight W. Allen, and Robert V. Oakford, working with a substantial grant from the Ford Foundation, replied to the cry "It can't be scheduled" by initiating the Stanford School Scheduling Project. This project was aimed at providing

computer assistance to the complex mechanics of scheduling new educational designs.

"Quad S" or "S⁴", as the Stanford School Scheduling System is sometimes called, was first implemented in 1963 after three years of research and programming. The experience gained in building and operating schedules in the four high schools first requesting scheduling assistance resulted in immediate educational and scheduling refinements. Further experience with twenty-six schools the following year, thirty-three in the third year, and with building more than fifty school schedules in the summer of 1966 has greatly improved the scheduling system itself and the effectiveness with which it is applied. Curriculum reform can and, in an encouraging number of instances, is being scheduled. It is now time to return to the point of detour—to experimenting with more creative ways of using existing educational resources.

The design of the educational programs in each of the schools scheduled using Stanford's system is, for better or worse, unique, and inevitably so. The program of each has been designed by a given group of people for a given group of institutional circumstances aided by the computer's capacity rapidly and accurately to weigh the availability of resources against alternative educational demands. The S⁴ computer scheduling system is a powerful scheduling tool because its generalized form allows it to consider the widest possible range of educational alternatives for the widest possible number of school situations. It does not build flexible schedules in the ultimate sense. Its dexterity gives educators the opportunity to build them. Flexibility results from choosing appropriate alternatives prior to the time the schedule is actually cast.

School scheduling, either by computer or manually, is a matter of bringing the educational design into balance with the educational resources of a particular school. The advantage of computer assistance is that it allows more efficient balancing of resources within a more effective educational design. The balance theory of school scheduling can perhaps best be described in terms of the basic resources that must be scheduled and the basic elements that make up the educational design. It must be kept in mind, however, that although the resources and the educational design elements are discussed separately here, they exist as a total complex in which they are interdependent. Any alteration in the quantity or configuration of any resource or element reverberates throughout the schedule.

The basic educational resources available for implementing an educational design are students, curriculum, staff, facilities, and time.

STUDENTS

Typically, a school exerts little control over the number of students to be enrolled. The enrolment is, however, a critical factor—especially when it is rapidly increasing. When additional students are absorbed without

increasing or reorganizing other educational resources, the result usually weakens the educational program. When growth in enrolment is slow and is met only by adding one or two teachers, this is still an inadequate response to the increased load placed on the curriculum. The student/teacher ratio is too crude a standard on which to base the reallocation of resources to meet changes in enrolment. The conflict potential created in individual curriculum areas that are understaffed or in programs for which facilities are inadequate must also be taken into account. Enrolment growth cycles, whether rapid or slow, can badly skew the resources and design balance.

CURRICULUM

The list of courses taught each year is often a useless catalog to the majority of students in a school. In a school with a traditional educational design, students can take only a small sampling of offerings. In one school listing over three hundred courses, for example, students were restricted to five courses each year. Simply increasing the number of courses in the list only increases the potential for conflict in the schedule. Where this increase is not matched by expansion or reorganization of resources, the possibility of scheduling more courses per student is progressively diminished. Much of the current experimentation and innovation in scheduling reorganization is an attempt to overcome the problem that exists when course offerings outstrip available resources.

If each of one thousand students in a school adds one course to his schedule, it is obvious that the educational design must be altered to retain a balance. The fact that this can be done without substantially increasing costs has been demonstrated. In nearly every school in the Stanford Project, the number of courses a student can request has been increased by at least one. In some cases the average increase has been as high as three courses per student.

Although educators are reluctant to reduce curriculum offerings in a given year, some relief has been found to the courses vs. resources dilemma in the old technique of offering a course in alternate years. The alternate year curriculum design reduces the annual curriculum without reducing the total curriculum. By offering courses on an alternate year basis, the student has an opportunity to take more courses, and more students may have the opportunity to take the same course. By offering singletons in alternate years, the need for multiple-course preparations per teacher is reduced. In small high schools, the alternate year curriculum has been particularly effective. The curriculums of some small high schools have been doubled by crossing grade lines and teaching even multiple-section courses in alternate years. In one of three Stanford Project small high schools reporting success with this technique, the curriculum was expanded from 45 courses to 108, and the students increased their average annual curriculum from six courses to nine.

STAFF

The quality and the quantity of staff resources available in schools is often directly related to the amount of local financial support. Since the difficulties of increasing local support are formidable, it would seem appropriate to explore more efficient and effective methods of using existing professional staff. Highly trained teachers should be relieved of mundane tasks. Clerical work and routine supervision of students in study situations should be assigned to paraprofessional and clerical assistants to free teachers to work more closely with students. Differentiating staff functions and using more teacher assistants may be a viable means for increasing the utility of staff resources without escalating costs. Such possibilities for differentiating the staff now become possible with a flexible schedule.

FACILITIES

Poor facilities are sometimes an irritant in education, but they are seldom a serious deterrent to learning. It is difficult to generalize past this point since the facilities of each school are unique. Research is needed to determine, in specific terms, the relationship of facilities to different educational designs. With a little imagination, however, many facilities problems can be solved by opening old facilities for new uses. Storage space can be converted inexpensively into teacher offices. Shop classrooms and laboratories can be used for academic classes in many cases. Independent study carrels can be arranged along wide halls. Classrooms can be converted to teacher offices, resource centers, academic laboratories, and small group areas. Auditoriums, cafeterias, gymnasiums, and multi-purpose rooms can often be equipped as effective large-group lecture areas. The full potential of existing facilities resources in older schools is rarely fully exploited.

TIME

In many respects, time may be the most significant resource scheduled. Traditionally, time has been ignored as a crucial variable in learning. Do we really know that ninth-grade English is completed when June arrives? Is learning really independent of time? The theory of individual differences tends to support the position that the time to learn a specified outcome varies from one individual to another. Further, the relationship between learning and time spent with a teacher is less than ordinarily assumed. It is possible that education suffers most from too much teaching and not enough opportunity for learning. All of this suggests that time represents a scheduling resource which educators must make more challenging use of than they have to date. As new discoveries are made about the learning process, more appropriate allocation of time will become even more important. The results of innovative schedules built under the Stanford Project lend strong support to this hypothesis.

The basic elements in the educational design are the size of the group

in the different modes of instruction: medium, large, small, laboratory, and individual study.

MEDIUM GROUP

The traditional instructional mode in medium-size groups of twenty to thirty students for fifty minutes five days a week may be an appropriate design for some kinds of instruction, but certainly not for all. If a design is based on sound learning and pedagogical principles, it is worth a trial. If the design is primarily a function of tradition, it may constrict the learning environment.

The important issue is why teachers request a given design. Foreign language teachers often structure their courses with a medium-size group. They want frequent contact with their students in small group structures but limited resources dictate class sizes of twenty-five to thirty. In the case of foreign language instruction, however, this traditional mode often houses a modern treatment. Other teachers are not ready to change their mode of instruction. There is, however, a basic need to change teaching behavior to meet the new demands of changing educational objectives. Until this is done, there is not much hope for creative educational designs. In the Stanford Project schools, traditional class grouping has come to play only a minor role.

LARGE GROUP

Concepts which can be most efficiently (and often more effectively) taught to many at one time should be organized for presentation to large groups. In the Stanford Project schools, the large-group mode of instruction has gained wide acceptance. There has been a steady increase in the number of teachers and subject areas using the large-group mode and a steady decrease in the total proportion of time devoted to large-group instruction. Few courses are designed to use more than one large-group meeting per week. Teachers seem to agree that large groups should not be scheduled for more than forty minutes, and most teachers prefer to limit large-group lectures to twenty-five or thirty minutes. It would appear that careful analysis of course content and method by teachers tends to reduce the proportion of material best suited for large-group presentation.

LABORATORY

The laboratory concept has a long history and wide acceptance as an effective mode of instruction. As an element of design, laboratory instruction refers to any situation wherein the student actually applies concepts or principles. Therefore, laboratory work has a broad application in every area of study, whether it be in science, physical education, English, social studies, foreign languages, speech, or in the fine and practical arts.

The long laboratory periods of two, three, or even four hours were a hazard to effective scheduling in the Stanford Project schools. They were

abandoned, however, for other than scheduling reasons. Teachers attempting to plan meaningful laboratory experiences for groups found student concentration rapidly diminished after the first fifty minutes. On the other hand, they observed that individualized laboratory assignments created a high level of student involvement over a long period of time. Project schools thus developed the "open lab" concept. The "open lab" is an appropriate laboratory facility, supervised by an appropriate teacher, that is available for students to use at their discretion for individual study. Both scheduled and open laboratory instruction are important elements in project schools, but scheduled labs are decreasing, and they are seldom designed for more than an hour of group activity. One problem with the "open lab" concept is that the highly motivated student may tend to spend too much time in a particular lab. This problem can be solved by intelligent teacher guidance.

SMALL GROUP

In small group instruction, concern is more with individuals than with the size of the instructional group. The focus must center on the behavior and roles of the group members. Meaningful small group instruction requires a substantial change in the method of teaching, and without a thorough knowledge of small-group objectives and techniques the cost in time for both staff and students will be prohibitive.

The small group can be defined in terms of psychological pressure. If one hundred students are confronted by one teacher, there will be negative pressure for direct interaction. The psychological pressure to interact in a tutorial relationship, on the other hand, is so strong that lack of interaction would be considered neurotic. When does this reversal occur? Evidence exists that the pressure for interaction is high in a group of from ten to twelve students. Positive interaction should be both experimented with and applied on a greater scale than it has been in high school education. The interacting group provides pertinent information about the needs of students and hence valuable guidelines for individualizing instruction. Some highly skilled teachers demonstrate an outstanding ability to observe and respond to students and in so doing make open student interaction a powerful learning tool.

In the design request of all Stanford Project schools, small group configurations are increasing. In general, small groups take up some of the time relinquished to obtain large group and open laboratory elements in the overall design. Most experienced and successful small group teachers suggest that small groups meet for one hour or more each meeting and that they include no more than twelve students. Although one such meeting a week is usually adequate, often a second small group meeting each week is requested if student and teacher time is available.

Individualized instruction based on a low threshold of teacher response to student cues is critical to a productive individual study design. At the

same time, students must be continually encouraged to accept more responsibility for their own learning.

Individual study in Stanford Project schools is scheduled as an integral part of the overall instructional design. The resources of the school are deployed specifically to enable individual study to function. Teachers need time for response to individual needs. Student responsibility for independent achievement must be matched by time, assistance, and materials made available for this purpose. Individual study is a powerful learning mode that requires careful planning. Immediate reward and direction given during a period of high student motivation can produce outstanding results. To ignore or misinterpret student cues may mean a real learning loss.

Stanford Project schools have continually verified the importance of individual study in their educational design. In the first year of Stanford's experiment, individual study time ranged from 20 to 40 percent of the total design. It now represents 35 to 55 percent of the total design. The schools report that the critical level is about 35 percent open time for most students. Students with more than 35 percent open time appear to need more open time. Students with less appear to need even less. This phenomenon is an important one to consider in making decisions about individual study.

Emerging Patterns

A myriad of instructional designs have been processed with the Stanford system during the past five years. Some were used only once. Some have been screened by as many as three years of evaluation and refinement. We find a degree of similarity of design emerging within nearly all fields, although differences in learning activities within these similar designs are still very great. A few fine arts courses will illustrate these recurring patterns.

Art, even in its most controlled stylistic forms, seems to have encouraged a liberal movement of thought and emotion in man's history. It is not surprising then that the idea of the unscheduled or "open" lab originated in the art department. One design used by experienced art teachers in the Stanford Project schools utilizes one 40-minute large group meeting each week for basic information and inspiration, one 40-minute instructional lab meeting to teach various basic techniques and media (this phase is often dropped by midyear), and the remaining time for open laboratory. This open design relies upon student motivation, individualized instruction, and performance.

Other art teachers tend to prefer more scheduled laboratory experiences. In another design the large group meeting of forty minutes once each week is retained, but the students are scheduled into the art room twice each week for one hour and twenty minutes or more. This design is easier to control but it limits individual freedom. The teachers using it, however, often give wide latitude to individual students, and for many the art class is

actually an open lab. This controlled lab design is the forerunner of the completely open design.

An art teacher who requests the open course design places a high priority on individualized instruction. The design offers some definite advantages in scheduling. By reducing the number of scheduled group activities, the open course design makes only minimal demands on the resources of time, staff, and students. Since the conflict potential in art is substantially reduced by this design, more students can participate in the art program. Even with more students, the fundamental instructional goal—individualized instruction—is maintained. This design is a prime example of how appropriate deployment of resources within selected design alternatives has better served educational goals.

Band and Chorus Patterns

Two basic designs for band and chorus class have developed which derive from the fact that these are performance groups. The first follows the traditional pattern of daily full-group practices sessions, i.e., a 40-minute to one-hour meeting of all members each day. This design is extremely demanding of staff, student, and facility resources. It requires approximately 280 to 300 minutes of scheduled activity each week, or one hundred percent of the time allocated to the course. Any individual or section practice is optional and must be accomplished beyond the scheduled time. This unscheduled activity often occurs before or after school, or at the expense of individual study time allowed by other less structured courses.

The only way to schedule a closed design of this kind without a high conflict potential is to give the course a very high scheduling priority which allows the assignment of students to this course to preempt their assignment to others. Although this assures all students requesting this music course will be able to take it, the time is still assigned, and the potential for conflict is merely transferred to the students' remaining course assignments. The question is how much priority should band or chorus have? At what cost? What is the appropriate role of music in this particular school in relation to the total program? The answer too often given by others not in the music department is sadly known.

The second band and chorus class design which attempts to alleviate some of these problems calls for two or three full group practices per week. In addition, each student meets once or twice each week for a section rehearsal, such as brass, strings, or percussion. This design also schedules an hour or more of practice each week. Being open, the second design consumes approximately 200 minutes, or 60 percent of the available time per week and leaves 80 to 100 minutes for individual practice. As a result, resources are less taxed, conflict is substantially reduced, and more students are accommodated in the music curriculum. The question remaining

under this open design is no longer one of how to allocate resources but one of whether or not the goals of the music program are being met by the instruction. This is but an example of what is being done to open up the possibilities for more students to participate in the arts.

Clearly the time has come for teachers and administrators in local schools to make the decisions that they were excused from making when innovation could not be scheduled within the limits of time. Where there is no money for more teachers or more facilities, educators can now experiment by deploying existing resources in new instructional configurations to achieve the same objectives that once only "more resources" promised to achieve. Computer scheduling and new curriculum designs will not solve all of the problems of educational change, but if properly applied they will discover the solution to many and implement changes for the better. Now that the scheduling roadblock has been removed, it is up to educators to move forward.

Computers and the Curriculum—Understanding Generates Caution

Curtis Van Voorhees

The digital computer is one of the most widely discussed devices to enter the educational scene in some time. The computer is seen as a device which provides solutions to problems in the areas of scheduling, curricular reform, reporting, teaching, and many other problem areas in education. However, this device has certain limitations which should be understood by educators before they attempt to make use of the computer in certain areas. This article is a discussion of the relationships of the computer to the area of class scheduling and its subsequent relationship to curriculum.

An Overview of Scheduling

As high schools have grown in size, the process of arranging class schedules for students has become more involved. As a consequence, the process of class scheduling has become a process of scheduling for administrative convenience. Students have been expected to adjust to schedules rather than the reverse.

It has been my experience that, typically, schedules are determined by such factors as:

a. Most physics students take band and advanced language, therefore these three classes must be scheduled at different times.

b. There are six periods per day and every student must be scheduled into a class each of the six periods.

c. The physical education teacher is the football coach and must have the last hour of the day to plan for practice.

These and other "important" considerations are typical of the "significant educational considerations" that constitute the planning of many high school schedules.

Schedules are generally built on a series of student class requests. Counselors often go through the motions of helping students design an individual program but are frustrated by the realization that as many as five out of six classes may be required. Class requests in each area are then totaled, and the process of building the master schedule is undertaken. This process usually takes several weeks and is completed by an administrator or counselor. Once the master schedule is completed students are assigned classes to fit the master schedule.

While it seems desirable that students be assigned to classes based upon some prediction of success in a given situation, it would also seem that the complexities of hand scheduling are such that this is seldom possible. The counselor helps the student choose class titles but is frustrated in that the assignment of teacher, time, and place are left to chance. However, it cannot be said in all fairness that all systems operate from a standpoint of expedience alone. Some few schools attempt to design the class schedule to meet each student's needs and to assign the student to a teacher with whom he is most likely to succeed. In the experience of this author, however, attempts to individualize schedules have been the exception rather than the rule.

Computer Aided Scheduling

When computers entered the educational scene it was evident that they had potential in the area of scheduling. Today, some few years after the first computer program designed to schedule students into classes, we find that hundreds of schools throughout the United States are using computers to aid in the scheduling process. Computer aided scheduling programs are gaining sophistication at a rapid rate. The reason for rapid adaptation of the computer to the problems of scheduling is quite evident when one realizes that the computer can do in a few minutes that which would take school personnel weeks to accomplish—and can do it more accurately and more efficiently. It is possible for the computer to schedule in any way that we are able to sufficiently define.

Computer programs can be divided into two classifications, *class-loading programs* which place students in classes, maintain class balance, assign rooms and teachers, and keep class count; or *master-generating programs* which do the former, and in addition design the master schedule from the

information provided by teachers and administrators designing the curriculum.

Class-loading programs accomplish the task of placing students in classes according to predetermined master schedules. Basically this is a process of matching student requests with available classes. While class-loading seems, at present, to be a necessary administrative task, this type of program is only as effective as the master schedule from which it operates. Student request cards are compared a specified number of times to the master schedule on a first-come, first-served basis and, if no satisfactory schedule is found, the student's schedule is declared "in-conflict." The programs currently in use aid in the mechanics of scheduling but have little to do with individualizing student schedules.

Class-loading programs are usually designed by regular programmers working with school staff members. Program limitations are generally controlled by the capacity of the computer, the ability of the programmer, and the imagination of the school staff.

Whereas the class-loading program must work from a master schedule, the master-generating program schedules students and designs the master schedule at the same time. Master-generating programs are not currently in widespread use because few such programs exist. Additionally, master-generating programs require computers with a vast amount of core memory to be of practical value.

One master-generating program which is currently in use is the Stanford School Scheduling System (SSSS). This program, designed by R. V. Oakford to aid in the implementation of flexible scheduling, is being used by several schools throughout the country. However, SSSS is currently available only to school systems involved in unique programs of experimentation.

The SSSS program will design, from data provided by the school (e.g., student class requests), a master schedule which is relatively conflict free. There are, however, restrictions placed on the user in the form of maximums in certain areas. These maximums are reasonable and should not serve to limit most programs. The SSSS program has shown that curricular patterns which vary from the typical can be scheduled in spite of their complexities.

Educational Values of Computer Scheduling

Even as they are used today computers can hardly be termed an educational gimmick. However, the value of computers in scheduling is currently visible, primarily as an administrative aid. While it is true that many schools may try various curricular innovations because the computer is available to aid in scheduling, it is also true that the computer may serve as a roadblock to better curricular patterns. If scheduling by computer does not result in more meaningful teacher/student pairings, is not flexible enough to allow an individualized curricular pattern, then the computer may serve

to stifle creative curricular innovation. One inherent danger is that school personnel may hesitate to initiate change which involves the creation of new computer programs.

Computers cannot do more than that which they are told how (programed) to do. The value of a computer generated schedule depends totally on what goes into the planning of the curriculum, and the computer program designed to implement that curriculum by placing students in learning situations. The computer is simply a useful tool which allows a faster and more efficient method of scheduling. Programs which may have been nearly impossible to implement because of the time involved in scheduling may now be possible through the use of computers.

The computer should free the administrator from the bulk of the scheduling procedure. As this occurs, an obligation on the part of the administrator is implied. The administrator must actively involve the teachers and counselors in the process of curriculum development. Every attempt must be made to assure that individual class schedules and student/teacher pairings will be made to the educational advantage of each student. Through staff involvement the administration must now have available:

a. Well-planned class requests from each student as a result of intensive counseling without regard to a fixed schedule.

b. An indication of the best teacher/pupil pairings for each student.

Without curricular planning, counseling and teacher/student pairings, the computer will remain a device for faster scheduling, but little more. Computer scheduling should free the principal so that he may provide educational leadership and initiate a drive toward better education for every student. When the principal need no longer involve himself in the mechanical aspects of scheduling he should be able to devote much more time to the educational aspects of scheduling.

How Can I Use Computer Aided Scheduling?

Class-loading programs are available at many university and local area computer centers. One who does not have ready access to a computer may be able to rent computer time or buy in on a program for a fixed amount per pupil. The primary problem involved in "farming out" scheduling is that one must generally accept the program provided. The mechanics of the program are set and the buyer has little or nothing to say about the way the computer places students in learning situations.

Class-loading programs are relatively inexpensive when compared to the cost of administrative time used in class-loading in the traditional way. It must be remembered, however, that the school still must prepare the master schedule.

Master-generating programs are more difficult to purchase Very few such programs are available and even these on only a limited basis. SSSS is gen-

erally available to schools undertaking special curricular programs. As greater interest develops in master-generating programs it seems certain that university centers will attempt to design programs similar to SSSS and will purchase the equipment necessary to aid local schools in scheduling. Administrators should study their scheduling procedures so as to be ready when computers are available to their system.

The Future of Computer Aided Scheduling

It may be that the novelty of computer aided scheduling coupled with the obvious ease with which scheduling by computer can be accomplished, may lead many schools to accept computer scheduling with little or no regard to the limitations the computer program may place on the future of their educational programs. Schools may become tied to their current educational program simply because they assume they will lose the advantage of computer aided scheduling if they change. If this happens then the computer, which should serve to aid in the process of positive change, may serve to retard change. Somehow the users of computer aided scheduling must have control over the computer programs. Otherwise the tendency to stand still may become too great. The computer must not be allowed to dictate the curriculum. Rather, computer programs must be designed to comply with the need in any given situation. The computer must continue to serve as the slave of education and care must be taken to see that education does not become a slave to the computer.

In the near future it seems logical that computers will continue to aid school systems in an attempt to improve curriculum. As new curricular patterns develop it seems that the possibility of a truly individualized curriculum should approach reality. When, and if, this happens there may well be no need for computer aided scheduling. Education on an individualized basis may become the rule rather than the exception.

It seems hardly possible that the computer will cease to serve the school at any time in the foreseeable future. Its use as a scheduling aid may become nonexistent but its potential as an aid in areas such as information retrieval, computer aided instruction, and counseling is immeasurable. The computer will continue to serve education to a greater degree in the future. However, the services which the computer provides should and must change if computers are to aid in educational change for the good of mankind.

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CHAPTER FOUR

Think First, Be Creative, Then Schedule

J. Lloyd Trump

Flexible scheduling is a change in the state of mind as well as alterations in the use of time. School personnel need to go beyond buying computer time, copying another school's schedule, or substituting "modules" for periods. Much more is needed than taking time from one department to give it to another. Major gains for pupils and teachers result only from basic changes in what teachers and pupils do in a school.[1]

What changes in the use of time are needed in schools? The heart of the learning process for pupils is *independent study*. That term needs clarification. I define it simply as what pupils do *when their teachers stop talking*—when the pupils themselves experience learning by reading, listening, viewing, thinking, writing, making things, and evaluating their own progress. Their teachers have told them what to do and now they are doing it—each according to his own talents and interests. Sometimes the pupil works alone in his independent study; more often than not he works with other pupils in various kinds of study and work groups. The excellence of any education is directly proportional to the quantity and quality of independent study opportunities that the school provides for all pupils. Therefore, the school aims to provide more time for independent study and to reduce the amount of teacher talk in all school subjects.[2]

As a matter of fact, most school subjects should meet *in scheduled groups* only twice a week—once for the teachers to talk or present materials and once for pupils to learn how to communicate orally and to respect each other in the process. The latter activity calls for small discussion groups with no more than fifteen pupils. Teacher presentations may be made in large groups, the size being irrelevant to success so long as each pupil can see and hear well.[3]

The foregoing arrangements directly affect flexible scheduling. Without them a so-called flexible schedule may be only partly effective in providing more individualized learning. Some "flexible" schedules are quite rigid.

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[1] Trump, J. Lloyd and Delmas F. Miller. *Secondary School Curriculum Improvement,* "Barriers to Improvement" (Boston: Allyn and Bacon, 1968), pp. 257-62.

[2] *Ibid.,* "Independent Study," pp. 264-73.

[3] *Ibid.,* "Large-Group Instruction," pp. 274-80 and "Small-Group Discussion," pp. 281-88.

Music educators need to join their colleagues in further study of ways to individualize learning, professionalize teaching, and refine content so that each student may have a better general education and more time to explore and learn subject areas where he has special interests and talents.

Only as the school increases the amount of time that pupils have for independent study will music teachers find larger numbers of pupils free to participate in music activities along with other interests. A truly flexible schedule that reduces regularly scheduled classes to forty percent of the week leaves sixty percent for pupils to practice and perform music or take field trips without conflicting directly on a given day or week with other classes. The pupil then has an opportunity daily to make choices—and music teachers know that these choices do not permanently affect a pupil's relations with other teachers.

Developing a flexible schedule is an all-school activity. First, there needs to be commitment to the concept of individualizing pupil learning—making it possible for each pupil to follow a program successfully that fits his talents and interests. Second, the plan should free teachers from their typical 25-period per week assignments to provide more time for important professional activities. Third, principals should have time to work with teachers in improving instruction and changing teacher roles. Fourth, curriculum content should be revised to separate what is essential, what is desirable, and what is enriching. In other words, the school personnel need to develop a rationale for flexible scheduling before deciding what changes in time are necessary.[4]

Who will start this process? It might be a principal, a supervisor, a science teacher, or someone else. No one has more motivation to start the move than you, a music instructor. I described in the December 1965 *Music Educators Journal* a number of approaches to flexible scheduling. Other specific programs are proposed elsewhere in this book. You and your colleagues will have to decide which method is reasonable and best for your school. However, keep in mind always that in the final analysis you and they will be most content when the total number of pre-scheduled groups is reduced and the amount of time for independent study is increased. Even more important, you will be making giant strides in meeting the individual needs of your pupils in music and in the other subject fields as well.

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[4] *Ibid.*, "Organizing for Change," pp. 367-75 and "Some First Steps in Curriculum Improvement," pp. 388-99.

CHAPTER FIVE

General Information On Scheduling

The Brookhurst Plan—An Experiment in Flexible Planning

Elayne B. Hofmann

Brookhurst Junior High School, in Anaheim, California, has been experimenting for the past three years with a pilot program for ninth graders which appears to be unusual if not unique in the United States. The Brookhurst Plan, under the direction of Principal Gardner Swenson, is based on a schedule which changes daily according to requests for time and students submitted by teams of teachers. Teachers may request a single student or as many as 350 for lengths of time which vary from twenty minutes to a full day (in the case of field trips or special events).

Under the Brookhurst Plan, a history teacher, instead of giving the same lecture six times in a day to six different classes, may call the entire history section for a large group presentation. He may devote the rest of his day to a variety of activities: leading a small group discussion of material in the lecture, planning future presentations, or conducting a review session for students needing extra help.

In another instance, a home economics teacher may request a two-hour block of time for a lesson in pie baking. Under a rigid schedule of 45-minute periods, she would have to have the dough made one day, the pie baked the next, and the finished product sampled on the third. Under the Brookhurst Plan, her class could go through the entire procedure in one day.

Perhaps the best way to describe the Brookhurst Plan in any detail is to provide answers for the type of questions someone unfamiliar with flexible scheduling might ask. For example, the first question anyone might ask would be:

Who determines the amount of time, the facilities needed, the size of the group, and the time of day for a particular activity?

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Teachers working in teams decide on what activity will best meet the needs of their students for any particular day. They then submit a job order—a request for time, facilities, and students—to the program coordinator who is responsible for making up the master schedule for the day when the activity will take place. Job orders must be submitted four days in advance.

How are priorities assigned?

Job orders are divided into three categories: classes that meet only once during the day, classes that meet more than once, and electives or "project areas" that meet throughout the day. The day is divided into modules (time blocks) of twenty minutes each. The number of modules requested will depend on the nature of the activity.

Who determines what classes a student will attend each day?

Under the Brookhurst Plan, each student has some leeway in making up his own schedule. Classes that meet only once during the day, however, are scheduled for him by the office. On days when academic subjects like English are taught in more than one section, the sections are listed on a "must" master schedule from which the student—with the approval of his scheduling group (homeroom) teacher—picks the one which is most appropriate.

For example, the student may wish to take English in module 6, when the class is scheduled in the library for independent study. Or he may decide to take English in module 8, when the teacher is conducting a grammar review for students who are having difficulty.

It should be noted that in the Brookhurst Plan electives are taught on a project basis; that is, the student, with his parent's permission, signs a project sheet agreeing to complete a certain amount of work. The elective teacher decides how much work must be done to earn a semester's credit.

The student, to a great extent, determines how much time he will take to complete the project. For example, a student with facility in typing may complete a semester's work in six weeks and then sign up for another elective. Another student with less manipulative skill or with greater demands on his time might take up to a year to complete a semester's work in typing. Nevertheless, he will receive the same credit as the student who completed the work in six weeks.

In this way, highly gifted or highly motivated students can take a greater number of electives than would be possible in a rigid scheduling plan. Less able students are not hampered by having to "keep up with the class"; nor must they be satisfied with acquiring only shallow skills in an elective subject.

What are the mechanics of the scheduling process?

Student programs are made up on key-sort cards like the one shown in

the illustration. These cards are handed out to the students the day before the schedule goes into effect. The classes that have already been scheduled for them have been written in by the coordinator and his teams.

By using this type of card, the program coordinator can sort out an entire class in one motion. For instance, if the program coordinator needs to schedule all the world history classes into a large group lecture in the auditorium, he merely "needles out" all those students enrolled in the course, writes the room and module on each card, and returns them to the deck of student cards for that day.

When the student picks up his program card the next day from his scheduling group teacher, he notes the classes he has been scheduled to attend. He then consults the "must" master schedule in order to fill in the rest of his academic courses. After he has scheduled all of his academic courses, the student can fill in his elective subjects from the elective master sheet. The completed schedule is then turned in to the scheduling group teacher, who checks it and returns it to the office for redistribution.

How long does it take a student to fill out his schedule?

It takes only about five to ten minutes (before the regular school day begins) for students to fill out their schedules.

How does the office handle the problem of providing a class roll?

The key-sort schedule consists of an original and three carbons. The student receives the original copy on the day that he is to attend the classes marked on the schedule. The second and third copies are perforated so that they can be torn into four sections by girls enrolled in office practice. The parts, or tags, are then divided by class and module. The girls place the tags in the teachers' boxes the night before the classes are actually taught, and the tags serve as class rolls. All fourth copies go to the attendance office, where they are filed in alphabetical order so that the office is aware at all times of each student's program for the day.

If a student is absent from class, his tag is sent to the attendance office, where it is checked against the office copy of his schedule. This procedure saves the teacher the trouble of having to keep a daily class roll and frees him from a great deal of clerical work.

Has flexible scheduling affected academic achievement?

Brookhurst ninth graders made significantly higher scores on SRA achievement tests given in the fall and spring at Brookhurst and at a control school. Further testing and evaluating is being carried on.

The Brookhurst Plan has a number of advantages. The greatest advantage is that it permits each student to adjust his schedule constantly to match his progress and ability. The plan also permits a capable student to spend a maximum amount of time in independent study. In fact, teachers may

excuse students from certain class activities or from the complete course when they feel that independent study or research would be of greater benefit to the student.

The use of a flexible schedule has been particularly helpful to us at Brookhurst in our work with potential dropouts. At one time, seventeen students who were having serious problems in school were placed in seventeen separate learning tracks—each one tailored to the needs of the individual student. As these students gained success in their individualized programs, they were able to return to what could be called a more normal schedule.

The Brookhurst Plan also has advantages for the teachers. Working in teams to plan activities and make up job orders gives each teacher the benefit of the special talents of other members of the team. The fact that the teachers plan and direct the program of instruction provides them with a healthy sense of involvement which is not often achieved in a set program handed down from year to year by the administration.

From the administrator's point of view, the plan has a special value. It not only helps him in developing a closer rapport with his staff through a genuine delegation of authority, but it also helps him to identify the creative, dynamic teacher.

Flexible scheduling demands a special type of teacher—one who is excited by the learning process, who can benefit from working with others, and can adjust easily and well to new ideas, methods, and procedures. The Brookhurst Plan embodies more than a flexible schedule, however; it is a complete educational program designed for individual learners.

Staggering the Schedule

Several years ago, the Pittsburgh, Pennsylvania high schools were becoming overcrowded, and the vocational-technical program was outgrowing school facilities. In response to the situation, a committee of teachers, principals, and members of the board of education worked out a modified school schedule.

How does this schedule function? Basically, it is a staggered schedule. The school day is defined as a nine-period day with classes beginning at 8:00 a.m. and concluding at 4:05 p.m. However, for the majority of the students and teachers, the school day is a seven-period day within a nine-period complex. There are three time patterns within the schedule: (1) 7:50 a.m. to 2:25 p.m.; (2) 8:40 a.m. to 3:15 p.m.; and (3) 9:30 a.m. to 4:05 p.m.

Early and late classes can be scheduled for special offerings, including vocational-technical subjects, science, home economics, and language laboratories. At the discretion of the principal, other classes (physical education, band) can also be scheduled in the early and late periods to provide extra time for activities. Special interest groups such as student council, yearbook, and stage crews are particularly suited to late periods.

All periods are considered instructional periods, and no activity periods are scheduled. The pattern of teacher assignment continues as in the previous schedule. Teachers have some perference as to early and late schedules, whenever possible.

The modified, or staggered, school schedule makes special and expensive learning facilities available to larger numbers of pupils because the school is open and operating longer each day. It also provides for juniors and seniors scheduled to early classes to have a better opportunity for part-time employment or further study than was possible under the previous rigid schedule. Also, with the consent of their counselor, students are able to add an elective to their schedule.

The Franklin Plan—Individualizing Study

After two years of preparation, Franklin High School has initiated a demonstration project of the *Franklin Plan* involving nineteen teachers and about nine hundred students (nearly forty percent of the school enrolment). The goal of this program is a more effective development of the student—both as an individual and as a member of society—than could be achieved in a traditional school schedule. To achieve this goal, Franklin High School rearranged its patterns of time, space, and available teacher talent.

Instead of the conventional six-period day, the *Franklin Plan* school day is divided into 27 fifteen-minute modules, permitting a flexible assignment of time blocks. Space has received a new treatment at Franklin. Walls have been built to divide former thirty-student classrooms into small "seminar" rooms; other rooms have had folding walls pushed back so that as many as ninety students can be accommodated for general activities. "Laboratory" facilities have been arranged for students to use during independent study time. These facilities are used by students on the traditional schedule as well as those on the *Franklin Plan*.

Teaching assignments have been reorganized to take advantage of individual talents and to provide greater efficiency. In two cases—plane geometry and English literature—teaching teams of three members each

share large-group instruction, each teacher supervising the material in which he is most knowledgeable. The teachers not on teams remain (as in the traditional schedule) solely responsible for all instructional activities in their classes, except that now they can meet all their students at one time for lectures, for demonstrations, for showing movies or playing records, and for giving tests instead of having to repeat these activities several times each day to individual classes.

Three types of learning situations are provided by the flexible schedule of the *Franklin Plan*: large (or combined) group instruction; small inquiry groups for discussion; and the independent study program.

Combined groups include all students enrolled in any one subject. Two or three times each week (depending on the nature of the class) all these students meet together to do things that can be done as effectively for many as for few, such as lectures, tests, and movies. The atmosphere is reasonably formal; the activity is teacher-centered; and the goal is efficiency.

Inquiry groups, on the other hand, are small, informal, and student-centered. Here the students learn by sharing ideas and working together on problems. Participation and cooperation are vital in these sessions, which occur two or three times weekly. Inquiry groups are both a carry-over (for clarification) and an extension (for application to specific problems) of the general activities of the large group.

Independent study, the third phase, is the most vital and probably the most confusing part of the flexible program. Conditioned by years of experience in the "teacher says, student does" school, everyone involved in the new program—students, teachers, and parents as well—requires time to adapt to the concept that in a formal school situation, a person learns best by doing things in which he is most vitally interested and for which he has the most talent.

Independent study is possible on three levels, each of which has a place in any flexible program sympathetic to the individual interests and abilities of individual students. The basic level is one traditionally labeled "homework." Some students have to work very hard to master material and need more time than evenings at home, or a one-hour study period at school, will permit.

The second level, which most *Franklin Plan* students will follow, is an extension of their class activities far beyond the "homework" level. Each student will select an area of study related to the class in which he is enrolled, and will concentrate on that topic until he achieves an "in-depth" understanding of it. His choice is to be made according to his own interest and ability, without consideration for what others in the class are doing. Time for this independent study is available because the student no longer attends every class 55 minutes daily, but instead spends a certain amount of time each week on the phase of each subject most suited to his interest.

Level three is the most sophisticated form of independent study and is especially appropriate for those students who are extremely gifted in a particular field. An outstanding music student, for example, might devote an entire semester (or more) to an independent study project involving the composition of an original piece of music. At this third level, independent study practically achieves the status of a separate class. It would, of course, be supervised by a qualified teacher.

All three phases of the *Franklin Plan*—combined group work, inquiry-group participation, and independent study—will be evaluated as part of the report card grade. Test scores and written assignments will usually be recorded as combined-group grades; inquiry-group evaluation will be based on the quantity and quality of the student's participation. Independent study will be evaluated by how well the student meets the goals he has established for himself. Conferences between the student and his inquiry-group teacher will establish these goals and evaluate his achievements.

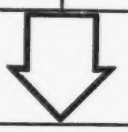
The Teacher's Role in Modular Scheduling

The present trend toward increased participation of teachers in decision-making is creating a timely opportunity for them to take part in developing the school schedule. Experience has taught us that a "good" schedule facilitates our instructional plans whereas a "poor" one restricts our effectiveness. Teachers, therefore, should be articulate in defining specific schedule needs for present and projected instructional programs.

A basic premise to the involvement of teachers in the development of the schedule is that teachers possess the professional credentials and competencies needed to define the effective teaching-learning situation. Their recommendations will deal largely with factors mentioned previously—the amount of time needed, desired class sizes, and proposed methodologies—but will also concern certain other matters, such as room availability and equipment. (These latter factors, however, have in the past received undue attention. While room availability and equipment do affect what we can accomplish, they are *not* the most significant deterrents to creative and imaginative instructional improvement and do not warrant the designation of "whipping boys," which they have frequently received.)

Immediate modifications can be made even within conventional schedules to provide present or future flexibility. Time and class size dimensions can be easily modified in certain situations. For example, if several sections of the same subject are offered during the same period, students can be scheduled into groups of different size.

ENGLISH 1 teacher 30 students	ENGLISH 1 teacher 30 students	ENGLISH 1 teacher 30 students	ENGLISH 1 teacher 30 students



ENGLISH (large group) 2 teachers 90 students	ENGLISH SEMINAR 1 teacher 15 students	ENGLISH SEMINAR 1 teacher 15 students

Similarly, classes can be modified if time allotments are considered on a weekly basis rather than on a daily basis. Five hours of instruction per week are provided in both of the following illustrations.

1.

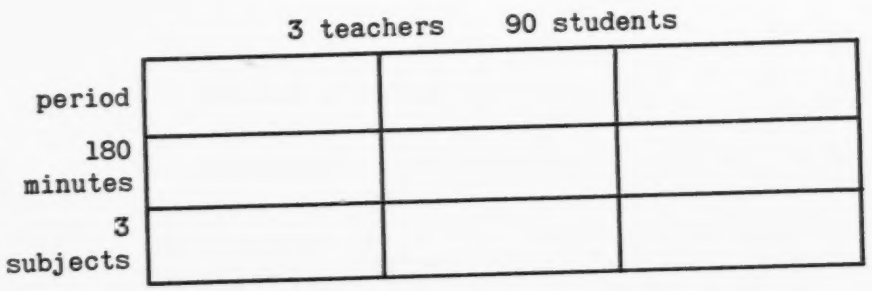
M Eng 1 tchr 1 hour	T Eng 1 tchr 1 hour	W Eng 1 tchr 1 hour	Th Eng 1 tchr 1 hour	F Eng 1 tchr 1 hour

2.

M Eng 1 tchr 2 hrs	T No class	W Eng 1 tchr 2 hrs	Th Eng 1 tchr 1 hour	F No class

In the second example, *longer* class sessions meet *less* frequently. Modifications in both size of classes and length of class meetings can also create more flexible teaching arrangements. Several teachers of different subjects may use this plan to provide even more flexibility in learning situations.

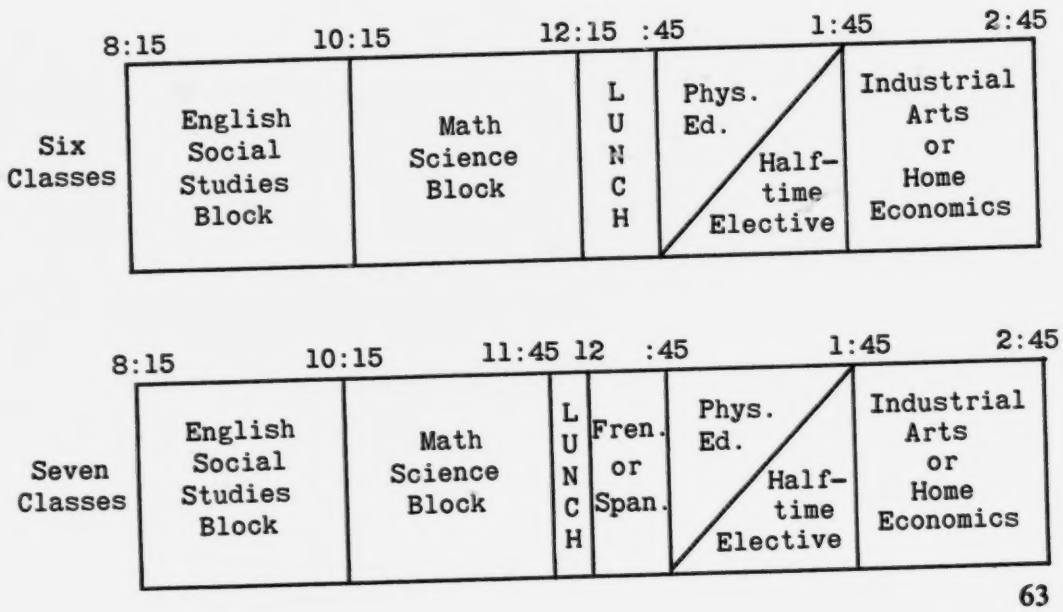
period	1	2	3	teachers
1	Eng	Soc St	Sci	
2	Eng	Soc St	Sci	
3	Eng	Soc St	Sci	



A common enrolment (i.e., the same students) is necessary if this plan for combining disciplines is to be successful.

Because of the complex nature of a school system, changing the teachers' schedule recommendations from theory to practice often involves as much compromise as agreement. At Whittier Junior High in Livonia, teachers were asked to define the optimum time allotments for their classes. After these were received, a number of schedule designs were considered. It was not possible to implement the suggestions of several teachers and departments, however, without moving into time segments smaller than the traditional 45- or 60-minute class periods. A shorter 15-minute module program was adopted which made it possible to provide classes of different lengths, all in multiples of 15 minutes (30-, 45-, and 60-minute periods).

This modular design allowed us to create classes of different lengths for different courses and also classes of different lengths for the same courses. One of the results has been a schedule which includes either a six- or seven-period day for students, allowing a variance of electives.



Whatever schedule design is selected to implement an improved instructional program, the place to begin is with teachers' recommendations. Without teacher involvement, schedule changes may be empty of substance and fail to achieve the advantages sought.